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Number 3

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OSMOSE TREATED LUMBER

Journal of Forestry

Official Organ of the Society of American Foresters

The Forest Future of the South[1]

Ronald B. Craig and William A. Duerr

U. S. Forest Service, Washington, D. C.

ONE OF THE MOST INTERESTING and challenging aspects of the South's forest future, it seems to us, is the contest now shaping between the expansion of wood industry on the one hand and the extension of forest management on the other. Never in world history has any region attempted what the South will apparently attempt in the years just ahead: to turn out a greater flow of forest products while at the same time dedicating vast new areas of land to conservative forest management that involves building up growing stocks. Can the South have the forest cake and eat it too? We would like to devote our attention to this one aspect of the South's forest future.

Not only is the problem unique, but the forests for which the problem is posed are also unique. The 12 southern states contain the largest body of rapidly growing softwood forests on the face of the earth. The South's growth potential for pine under good management is estimated at some 76 million standard cords annually—more than half of the softwood growth potential of the United States and nearly a third of the potential of the entire world this side of the Iron Curtain. Considering that eight-tenths of the world's use of wood is softwood, that there is everywhere a pinch for this commodity, and that the United States itself is a heavy importer of softwood timber and its products, it is obvious that the South has the lion's share of productive capacity for a critical raw material. With this in mind, and without meaning to slight the great importance of the hardwood resources, we would like to direct our look into the future largely at southern pine.

In preparing for this look ahead, we asked questions of a great many foresters, industrial people, educators, and others throughout the South who either control forest land or are in a position to judge what is happening on forest lands. Consequently what we have to say is not so much a prediction as a report on the plans and hopes of influential people and an interpretation of how these plans and hopes will shape the forest future.

Where Is Timber Growth Headed?

The South is now growing about 42 million cords, net, of all pine timber yearly. This growth includes a little over 12 billion board feet of saw timber (International ¼-inch rule). Current growth is thus roughly half of the potential. First of all, then, let us take a look into the future—not a long look, but say, a decade to a decade and a half hence—to see, if we can, where the South is headed in terms of pine growth.

The amount of pine growth will depend, first, on the acreage devoted to pine production and, second, upon the character of forest management on these lands.

Southern pine forests — those bearing at least one-fourth pine—today aggregate about 103 million acres. In the long run, if the production of pine is pushed hard, this acreage may be increased about a sixth, to some 120 million acres, mainly by converting land already in forest from hardwood to pine. But for the near future we look for little change in pine area. While more acres every year are being planted to pine, and some open lands are reverting naturally to pine forests, these shifts will, we believe, be at least offset by forest conversion to pasture and by pine conversion to hardwood. So let us think of 103 million acres of pine forest. What about management practices?

Large Owners Lead the Parade

Plans for forest management are easiest to determine for that part of the forest made up of large and moderately large holdings—5,000 acres or more. About 36 million acres of pine forest is in such holdings. In 1945, judging by the nation-wide forest reappraisal, owners followed good cutting practices on close to one-half of this forest.

The proportion of good management is rising fast. That is plain to be seen on the ground, and the same story appears in the replies from our respondents. Pulp company forest lands owned or leased long-term total roughly 12½ million acres, more than double what they were 6 years ago. The ultimate goal of pulp company acquisition appears well in excess of 20 million acres. Some lumber companies, too, and other big-scale forest interests are acquiring more land. Some of the acquired land is in small tracts, but most of it is already in large holdings. The acquisitions with little exception spell good management. Meanwhile, management practices are improving on the remainder of the large private holdings, and the public holdings will continue under predominantly conservative treatment. All in all, the expressed plans of the large owners indicate that by 1965 roughly 80 percent of their pine lands will be under good management, including intensive fire

[1]Paper given at 51st Annual Meeting Society of American Foresters, Biloxi, Miss., December 15, 1951.

control. If this prospect should materialize, one might expect a total annual growth on large tracts of perhaps 23½ million cords of all pine, including 7 or 8 billion board feet of saw timber.

So much for the large holdings. What about the 67 million acres of pine forest in tracts of less than 5,000 acres?

Small Owners Begin to Swing into Line

In the first place, let us agree that these small holdings are highly important. They comprise 65 percent of the total pine forest area and account for certainly more than half of the growth potential. The outlook for the years just ahead is that their aggregate acreage will remain nearly as large as now. They are therefore an essential part of the forest future and perhaps the key to it.

The vast preponderance of the small holdings are rather poorly managed. The 1945 reappraisal found only 2 percent of their total forest area being handled under good cutting practices. Such poor management has a number of causes. One, which our respondents emphasized most consistently, is that good forestry is akin to setting money aside in the bank, and few small owners can afford to hold for long a very large bank account. Of the many other factors involved in overcutting, we would like to stress just one: the tremendous pressure that falls upon the small holdings—that is, the "open market"—to produce wood as more and more large holdings come under conservative plans for storing up growth.

On the other hand, there are constructive influences tending toward better management on the small tracts. The people whose judgment we obtained ranked three influences above all others, and as a group gave equal weight to each of the three: first, better economic conditions and more favorable stumpage prices; second, the fact that private industry is providing technical forestry assistance and sure markets for timber; third, the state-federal cooperative programs of technical assistance and education, and of fire control.

With these conflicting influences in mind, we asked many of the respondents to estimate what percentage of the small holdings in about 1960-65 would be well managed. Need we tell you that the estimates ranged approximately from zero to 100 percent? The median lay between 20 and 25 percent. Evidently, if the group of respondents is at all representative, the South as a whole is setting its sights no lower than 20 percent.

If 20 percent of the pine area in small holdings were well managed by 1965, what would be the total growth of pine? In the case of the large tracts, we had numerous growth estimates of company foresters to use as a guide. Here on the small tracts the evidence was less direct and had to be supplemented by a good deal of personal judgment. The resulting annual growth figure is 30½ million cords of all pine, including 8 or 9 billion board feet of saw timber.

The South Aims High

Now we are in position to attempt answering the question whether the South can have the forest cake and eat it too. Our answer is—Yes, but not right away. The crux of the problem is how to build up growth and growing stocks without running short of wood for day-to-day use in the meantime. To meet this day-to-day need, it may very well be necessary to slow down the schedule of forest conservation represented in current plans and hopes. To minimize this conflict between today's need and the need of the future presents a tremendous challenge to southern foresters. And bear in mind that in speaking of the future, we are referring to a time 10 or 15 years hence—a very short time in which to improve growing stocks significantly. The plans and hopes to which we refer all relate to this short period.

Here is the picture in more detail:

Consider first the net growth on the total pine growing stock. The South's aims for pine growth a decade to a decade and a half hence on the large forest holdings and on the small forest holdings add up to 54 million cords a year. This growth would be 9 million cords greater than the current annual cut of some 45 million cords. It would be perhaps 4 million cords greater than the cut if we allow for the further pulp industry expansion that appears in the offing. In any case, the growth would somewhat exceed the cut. But now comes the conflict between today's need and the hopes for the near future. To meet the growth aim would call for increasing current growth some 30 percent in less than 15 years. That would require building up the growing stock. This in turn would mean accumulating some of the growth and not cutting it. Possibly a fourth or more of the growth would need to be accumulated. But the South simply does not have the margin of growth above cut to permit the rate of accumulation that would be required.

Turning from total growth to saw-timber growth of pine, we find much the same situation, though here the pinch is a good deal tighter. The growth aim is 16 billion board feet per year, again about 30 percent higher than the current rate. The annual cut now is about 14½ billion feet. A long time would be needed to accomplish the growth aim, modest as it is, while sustaining such a cut.

Our analysis, then, of current plans and hopes for southern forestry is this: The objectives are sound and obtainable, but not obtainable so fast as everyone would like. Meanwhile some of the aims for southern forestry are in conflict. The South may need to lower its sights in one or more of these ways: a less rapid accumulation of growing stocks on the conservatively managed holdings; a postponement of the time when the depletion trend will be reversed on the bulk of small tracts; a slower increase in pine output for industrial use. On the other hand, the South will need to raise its sights in every aspect of forest practice that will increase the rate of timber yield.

Through this discussion we have

spoken of the South as though it were all one uniform forest situation. But let's recognize how variable forest conditions really are. In wide stretches of the South, where the forest economy has advanced well along the road to sustained yield, existing plans for conservative timber management and strong industrial development are fully compatible. In other sections, however, the problems of constructive forestry are more acute than we have described them. In general, the Atlantic States of the South seem to be better fixed for the years just ahead than the Gulf States. Within the Gulf States, the southern portions are better off than some of the northern portions. Many of you can further localize such contrasts.

Some Forces That Will Influence the Future

The conflicts that we have discussed, between some of the South's plans and desires for forestry in the years just ahead, bid fair to set in motion powerful forces that will strongly shape the longer forest future. After all, forest owners and operators are not going to lay aside their plans; they are going to follow these plans as far as possible. We would like to list a few of the forces that we think will be released or augmented in the near future as a consequence of the fact that some plans are afoot which apparently cannot be carried out on schedule. In offering this look ahead, we assume that general economic activity will continue brisk. We assume, too, that our country will not be involved in total war.

Force number one: The pressure of the expanding cordwood economy. There will be a tendency for more and more of the activity in the pine timber economy to center around use of 10-inch and smaller logs for pulp and for lumber of everyday quality, as against the growing and use of 12-inch and larger logs for products of higher grade. In recent years, while total pine growth has been rising, pine saw-timber growth has diminished in the South at large. This general trend toward smaller-size raw material has a lot of momentum behind it.

Force number two: Growing competition between pulpwood users and small sawmills for pine timber in the open market. In the past decade pulping capacity in the South has tripled. In the same period small sawmills have increased in number from 18,000 to 23,000, and their share of total lumber output has risen from 60 to 70 percent. Most of the pulpwood and nearly all the small-mill logs come from the open market. To a great and increasing extent, they come from the same classes of trees.

Force number three: Growing cooperation between pulpwood users and larger sawmills in pine procurement. As these two groups of landowners build up their pine growing stocks and growth, they can be expected more generally to find ways of sorting and exchanging raw materials for mutual benefit. Greater pulpmill use of pine sawlog tops, slabs, and edgings seems also in prospect, as part of a general trend toward closer utilization.

Force number four: The wooing of the small woodland owner. He will be pursued more ardently than ever before by nearly everyone in the timber game and in forestry. Extension and technical-assistance foresters will be after him to raise his long-run contribution to the wood basket. Buyers will be after him for wood—some of them, no doubt, with long-term contracts. Pulp companies will search for methods of open-market procurement more favorable to conservation than the traditional contractor system.

Force number five: Adaptation of woods and mill technology to the use of smaller pine and of hardwoods. Changes in the character of available raw material and rising labor costs will see a heightening interest in developments such as these: sawmills that will handle small logs more efficiently, the use of bundles and long lengths in logging, the use of power equipment in logging, pulping processes that can take a higher percentage of hardwood.

Force number six: Rising prices for quality pine timber. The spotlight will be thrown on those large holdings where management has achieved high growing stocks of good quality. The market will offer greater incentives to all landowners to grow larger timber. These incentives will be re-enforced by the lowering of risks through better control of fire and pests.

Force number seven: Adjustments between the product and the market. On the one hand, producers will seek ways to meet traditional consumer needs with timber of less than traditional quality. Lamination, chemical conversion, and other means of adaptation will be emphasized. On the other hand, trends toward consumer use of substitutes will continue, and fundamental changes—perhaps permanent changes—will take place in consumer preference.

Force number eight: A redoubling of effort by foresters to increase the net utilizable rate of pine growth. This is the essence of the profession's responsibility. It will be backed by new knowledge based on research. There will be great emphasis on improved fire control, the elimination of unwanted hardwood from pine land, planting and other means for accelerating pine regeneration, silvicultural steps to reduce or anticipate pine mortality, closer timber utilization, and other constructive forestry measures.

Southern Forests, Then and Now[1]

Inman F. Eldredge, Sr.
New Orleans, La.

THE "NOW" PERIOD of my dissertation, of course, is well fixed; but at what time to set the "Then," the beginning, is the question. It would be interesting, if it were possible, to start the period as of the early days of discovery and exploration by the hardy Spaniards under De Soto, Ponce de Leon, and La Salle, for these colorful pioneers certainly had a good leisurely look at and an intimate contact with our forests from the Carolinas to Texas. But their expeditions were looking for gold or, for what is even more valuable, fountains that would make old men young again and give young men an everlasting hold on their youthful virility: They couldn't see the trees for the forest, nor the forest except as a sinister cover for hostile Indians and strange and dangerous beasts of prey. They left no descriptions of the timber or tables of acres and volumes such as foresters desire for consideration.

Or, I might start a couple of hundred years later — about the end of the eighteenth century— when several rather scientific-minded men traveled widely through the South and recorded their observations in some detail. But unfortunately none of these sojourners seems to have had an eye for forestry—they couldn't see the forest for the trees, nor the trees for the many new botanical specimens under them. Take Bartram's excellent journal of his extensive travels through the lower South in the 1780's—about all one learns about the forests from his journal is that there was a vast expanse of them every where he went. The great southern pine forest, one of the most extensive in the world, he dismisses rather unsatisfactorily with the description, "Those dreary pine barrens."

Then too, it might be right to start our period of observation as of around the time of the War between the States, since that has long been the favorite point of comparison in Dixie. But again no one seems to have recorded much about the forests of that time except that they covered vast areas, were found nearly everywhere, and had to be felled to make room for more cotton fields. So, I have decided to start the "Then" of this discussion of "Then and Now" at about the time I started my career as a forester—that is, soon after the turn of the 20th century. In this way I can tell the story as I have seen it unroll, and, incidently indulge the urge that every oldster feels to live again the years of his span; let nostalgia color them as it may.

Let us set the scene for the first years of the new century. The well dressed young man wore a high, stiff collar, spike toed shoes, tight fitting breeches, and "see more" jackets, and parted his hair exactly in the middle. The girls were glamorous, indeed, with big sleeves, well corseted waists, pompadored hair built on wire "rats;" they modestly hid their trim ankles under long rustling petticoats. Battling Nelson and Joe Gans were the fistic heroes of the day, although John L. Sullivan, the "Boston Strong Boy," was still fondly remembered. The automobile was a horseless carriage with a high tonneau and linen-duster-garbed passengers, and was seldom seen outside the cities. Beer was five cents a big stein, with a fine free lunch thrown in.

Forestry was as young and as hard to get in motion as the automobiles of the day. The forest reserves had just been turned over to the Forest Service of the Department of Agriculture and renamed "national forests." Since all of these were in the West, the South knew little of them and cared less. Gifford Pinchot, the dynamic chief of the Forest Service, had the enthusiastic backing of President Theodore Roosevelt, and was the big name in forestry, but the activity covered by that word was little known and even less understood outside of a little handful of technical foresters, nearly all of whom were in the Forest Service or in the few forestry schools then in existence.

In the South, particularly in the Deep South, original old growth forests of pine, hardwood, and cypress still characterized the timberlands that covered perhaps 75 percent of the total area. In the Southeast, earlier loggers had taken selected trees from narrow strips along the main streams, and second growth pine had followed. Cotton fields, abandoned during the long depression that followed the War between the States, had been taken over by young growth pine. A number of large lumber operations using northern capital and northern leadership had been established in the 90's in many parts of the South, and by 1900 many more had bought up vast areas, and the hegira of the lumber industry from the Lake states to the South had started. By and large however, at the beginning of the century the great original forests were still intact.

With the fate of the forests of the North freshly and vividly before them, a few men of a new tribe called conservationists, proclaimed the conviction that the southern forests were soon to be wiped off the map. But these gloomy preachments, mostly by yankee outsiders, were hardly heard in the South above the busy clatter of sawmills and skidders and the rumble of long log trains. The region, still crippled from war and punishment, badly needed new capital and cash income and the nation at large required the lumber in one of its greatest periods of expansion—for homes, industrial buildings and railroads—and besides, did not the vast pineries stretch beyond the horizon in every direction? So no one worried in the South, and the chips and saw dust flew in ever increasing tempo.

[1]Paper presented at the 51st Annual Meeting, Society of American Foresters, Biloxi, Miss., December 13, 1951.

The pine forests of the South then were truly something to see—big, tall trees of the superb quality that comes only with great age, standing almost shoulder to shoulder and covering wide, unbroken reaches of gently rolling, easily logged country in all the South Atlantic and Gulf States, with Arkansas and Eastern Oklahoma thrown in. In the Southeast, the turpentiners had worked southward from the Carolinas into Georgia and were turning westward. The old-fashioned cut boxes and deep chipping used then in the turpentine orchards took a heavy toll of old trees before the lumbermen got them. Further westward in Alabama, Mississippi, Louisiana, and Texas the old growth stands averaged from 12 to 30 thousand feet to the acre over whole townships.

The stands of mixed hardwoods in the fertile bottom lands of the many streams, large and small that reached the sea, were in every particular as spectacular as the pine in the uplands. The wide flood plains of the Mississippi River from Kentucky to the Gulf had as fine a hardwood forest ever as stood in North America. In the Appalachian Mountains and the Ozarks the mountain hardwood forests were just as extensive and hardly less valuable. Along the coast, all the way around to Texas, cypress trees of great age and magnificent size, the source of the "wood eternal," stood in heavy stands in the swamps and backwaters of the sluggish streams.

As a stripling forester it was my good fortune to see and work in many of these ancient forests of pine, hardwoods, and cypress in several parts of the South, and the memory of these high-canopied woods in the silent shade of which one might ride all day, and day after day, is still fresh in my mind. The memory is all the more treasured when I realize that neither I, nor any other, will ever see such forests again in the South. They are gone and gone for ever. The remnants that remain of the old forests are few in number, small in size, and as doomed as the ivory billed wood-pecker. Even when the woodlands of the South shall all have eventually been developed under the care and protection of foresters, we shall not see timber held until the trees are from 200 to 500 years old. It is more likely that the pine forests of the future will be managed on short rotations—say 30 to 50 years. The national forests will probably aim for a full sawtimber rotation and will keep the main pine crop for perhaps 80 years before final cutting, but even these stands will not resemble the naturally grown original forests of my youth. The 600-year-old cypress forests of the South will never be grown again, and it is not likely that the economics of forestry will allow hardwood trees to stand more than a hundred years at the most.

In the early years of the century wild fire in the woods was the order of the day, as it had been through the long centuries of the past. It was as regular as the seasons and as wide spread as the region. In the high forests that had grown up through them, forest fires seemed to cause but trifling damage. The fervid preaching of the few foresters in the South and the active missionaries of the Forest Service fell on deaf ears among both land owners and the general public. It was considered a crazy idea, characteristic of wild talking conservationists, and every year little ground-fires crawled among the pines, shrouding the South from Texas to Virginia with dense clouds of acrid wood smoke. The memory of those trying years of a disheartening and often losing fight to keep the woods green still occasionally haunts me. Few of us believed then that the demon fire would ever be brought under control in our time.

I was lucky to see the old forest of the South in its prime, for it did not last long in the face of the terrific pressure for lumber, timbers, poles, piles, and cross ties that built up like an ever rising freshet in the following decades. The Lake States forest was gone and the recently moved lumber industry was just getting started on the Pacific Coast; the South carried the load of the nation's increasing demand for building material, with the first World War to swell it. By 1920 the crest of southern lumber production was reached; by then it was painfully obvious that the old forest had been badly mauled. Wide and expanding stump fields were to be seen all through the great pineries, and the virgin hardwood forests and cypress stands were being bled white. One by one the larger lumber operations, their supply of timber exhausted, were beginning to close out and were either moving to the far West or, simply calling it a day, were junking their equipment and leaving the cutover lands to fate.

By 1930 the orderly retreat had taken on the color of a rout, and it commenced to look as though the worst predictions of the conservationists were coming true. The nation-wide depression of the 1930's, together with the rapid disappearance of old growth timber and expansion of competitive lumber production in the West, whittled the South's lumber industry down to a fraction of its former size and brought about a marked change in its make up.

As the big mills closed out, more and more of the South's dwindling lumber production was cut in little fly-by-night mills which, like jackals feeding on the bones left by lions, worked over the remaining scraps of the old forest. By 1940, over 80 percent of southern lumber was manufactured in little mills.

In the meantime something big was hapening in our forests. While economists, industrialists, and foresters were becoming resigned to the sad but apparently inevitable doom of the South's great forest resource, the God-given forces of nature were in the process of establishing a new forest on the bare cutover lands we had all but given up for lost. It happened so gradually and, to begin with, so modestly that even those of us living in the midst of it failed quickly to grasp the significance of what was taking place. It was not until the

results of the forest survey of the South were published in the 1930's that it was fully realized that we had a brand new forest, a lusty, fast growing, young pine forest of longleaf, slash, loblolly, and shortleaf, occupying the lands from which the old forest had so rapidly been stripped.

In terms of board feet and lumber quality there was little in the new discovery immediately to impress lumbermen of the old school, where practice and market were based upon big logs of high quality. Small mill men, starting first in the Southeast where the new crop of timber had developed longest, had already adjusted their operations to small low quality logs and were finding a ready market for cheap, low grade lumber. All through the region, it was not long before many of the large operators with their extensive land ownerships still intact, realized that the new crop was growing fast enough and was developing quality enough, not only to piece out the declining stock of old growth, but eventually to replace it, in most cases without a hiatus in production. Besides introducing an optimistic note for a worried industry, this struck a much needed blow for fire protection, for longer forest land tenure, and for forestry and foresters.

The publishing of the survey's findings had another and perhaps even more significant result. It attracted the immediate attention of the pulp and paper industry of the North which, having just entered one of its periodic surges of expansion was looking for new fields of activity. Its prospecting foresters found just what they wanted in the South—vast areas of fast-growing pine, presently too small for sawtimber, hence available for purchase at low cost. These sapling forests were capable of pulpwood production at a rate per acre that gave fair promise of operation on a sustained yield basis.

The development that followed in the next 15 years amounts almost to an industrial miracle. There had been a respectable pioneer representation of the pulp and paper industry in the South prior to 1930, but since that time the number of plants has increased five fold; and the pulp production of the region has been multiplied by ten. Judging by the number of recent requests for certificates of necessity for new mills and the expansion of established plants, the end of this remarkable development is still not in sight.

In addition to the healthy and timely lift that this massive investment of new capital and the greatly augmented annual cash income to landowners and labor has given to the economy of the entire region, there has been another effect that foresters should hail with particular enthusiasm. At long last, there has come about a real appreciation of the part that scientific timberland management can and must play if the wood-using industries, old and new, are to continue; and with it has come the acceptance of the forester into full blood-brotherhood in industry. The statistics will show that in no other part of our nation today are there more practicing foresters at work, particularly in industry, or a larger area of privately owned timberland under their management. And in that, too, the end is not in sight.

Long before the old forest had faded from the scene, there were foresters in the South, but they were few and far between and mostly employed on the four pioneer national forests, or as timber cruisers for private landowners. As the years wore on and the idea of forest conservation, under the leadership of the U. S. Forest Service, slowly took hold, the national forests were increased in number and size and, one by one, the states set up forest services. The number of foresters increased slowly but steadily, but still probably 90 percent of them were in the employment of the public agencies, federal and state, schools, and trade associations. It was not until the mass movement of the pulp industry that forestry in the South really blossomed and bore fruit, for paper makers, forestry minded to begin with, realized that the young forests upon which their huge mills must depend would rapidly melt away unless they were managed intensively under forestry principles.

The example of the pulp companies and the new, widespread market for pulpwood brought about the first full appreciation of the value of timber and timberland among all classes of landowners and shed a new light on the business of managing timberlands for sustained profit. Interest in forestry and the understanding of the functions of the professional forester in the new outlook grew apace; we had come into our own at last.

As of today the forests of the South present a very different picture from those I knew as a boy, and the economic climate that surrounds and conditions their management is in even greater contrast. A new forest and a new South have grown up in my time, and under my astonished eyes. The vast reaches of centuries-old high timber have gone as did the buffalo of the plains, and a brave young forest of immensely greater portent has fought its way through fire and brush to occupy its ground. The gentle, slow moving, agrarian South of my boyhood is hardly to be recognized now in the hustling, aggressive, and competitive region of today where industrialization bulks large in the land and is sweet to the taste of the people.

This new forest is not all that we could wish it. The young trees have neither the sawtimber quality nor volume of the original tall, slowly grown veterans of the centuries. The sapling stands are fast-growing but by no means as well stocked as they might be. There are still gaps where the ugly stumps of an earlier day show up all to well, and there are many vexing problems for the silviculturist and the economist to solve. The control of forest fire has made great and gratifying progress in the past decades, but we have a long row to hoe ahead of us before we can claim victory. But with all its obvious shortcomings, the new forests mean more in the destiny of the new South than did their

proud ancestors in their time.

We foresters are proud of this forest—not that we had much of a hand in its being—but because, in the main, it has been or will be given over to us to mold, to develop and to protect, so that it may serve its fullest purpose as a major asset of a great and growing region. We southerners are proud of it because of the part it has already played in our industrial growth and the rich promise it offers, under forestry, in our future development. We have it and this time, God willing, we are going to hold it, and cherish it, and make it to flourish like the green bay tree.

Building an Industry on Cut-Over Land[1]

P. M. Garrison
Chief forester, Gaylord Container Corporation, Bogalusa, La.

This is a story of Bogalusa, an industrial city, which did not exist prior to 1907. It is of necessity also a story of the Great Southern Lumber Company, the Bogalusa Paper Company, and the Gaylord Container Corporation. More than either of these it is a story of men—men of vision, courage and stature.

OUR STORY STARTS in the autumn of 1905 when two men and their entourage camped on the bank of Bogue Lusa Creek in the Florida Parishes of Louisiana. These two men, Frank and Charles Goodyear, had spent many days looking over the virgin pine forests of southeastern Louisiana. They were camped on the site of Bogalusa which was to be the domicile of the largest sawmill in the world.

As it later developed, the sawmill, log pond, and lumber stacks occupied approximately 200 acres. It was just over one mile from the edge of the log pond to the back of the lumber stacks. The log pond was dug by convict labor and covered 27 acres. The power house was equipped with 13 boilers, all fired with planner mill refuse. Here was generated enough power to run the sawmill, the pulp paper mill, and furnish the needs of the city. The sawmill proper was equipped with four 7-foot head rigs and one twin band rig. Four of these rigs were shot gun feeds, one of them a cable driven rig on which timbers up to 75 feet in length could be cut. The twin band mill, or "Tango" as it was called, consumed 1,500 small logs a day. A battery of 22 dry kilns was equipped with automatic lumber stackers. And, there was, of course, all the other equipment necessary to produce 1,000,000 board feet of lumber and timbers in 24 hours. Back of this were the forests, railroad, Shay and rod locomotives, log cars, Lidgerwood and Clyde skidders, and McGiffort loaders to supply the raw material to satisfy this hungry monster. Here at Bogalusa was invested $15,000,000 in forests, railroads, houses, and sawmill and logging equipment before one thin dime of revenue was taken out.

The two men, Frank and Charles Goodyear, who had the vision and courage to dream of an empire, did not live to hear the drone of the head rigs at their sawmill. But, as was to happen many times in the future, other men of courage and vision carried on.

Operation of the mill started October 17, 1908. In the next 30 years there was logged, manufactured, and distributed to the markets of the world 5,000,000,000 feet of southern pine lumber.

Logging practices were indicative of the times, every tree that was large enough to make a 2 by 4 on the "Tango" was brought to the mill. The power skidders destroyed whatever else escaped. It follows logically that the largest sawmill developed the most extensive cut-overs in the shortest time, accumulating these at the rate of 40 to 100 acres per day. Following the trend of the times, all means of developing these cut-overs were attempted: all phases of agriculture, row crops, truck crops, sweet potatoes, cotton, corn, dairy cattle, sheep, hogs, beef cattle, and chickens; but the cut-overs were either not suited to farming or accumulated too fast to be absorbed into the expanding agriculture program.

The waste from railroad logging, power skidding, and mill operation was tremendous. In 1916 one of the first southern pulp and paper mills was constructed in Bogalusa. It was built primarily to attempt to utilize some part of the wasted forest material. This mill succeeded in utilizing the raw material which otherwise would have been burned or left to rot. It expanded until it could use all the sawmill refuse and most of the tops and limbs. When that day arrived, the giant refuse burner was shut down and no spark of fire emanated from it until the cutting torches converted it into scrap in 1939.

After four years of pulp and paper mill operation it became apparent to the men of vision and courage that if this new industry was to survive beyond the life of the sawmill it must have other sources of raw material. Survive it must, because the capital investment and maintenance was such that this new industry could not conceivably be a transitory one.

Again, as in the beginning, the company was fortunate in having men in high places who had the vision and courage to embark on a new and untried project—the rehabilitation of denuded cut-over land by hand planting and seeding pine trees.

The vice-president and general manager, W. H. Sullivan was a man who had come to Bogalusa in the very beginning and had managed the Great Southern Lumber

[1]Paper given at the 51st Annual Meeting, Society of American Foresters, Biloxi, Miss., December 13, 1951.

Company since its inception. Mr. Sullivan had vision and courage; he was also a very rugged individualist. He had seen sawmill ghost towns in Pennsylvania and in the South. His greatest ambition was to insure Bogalusa against becoming a ghost town. Here was a new southern industry; if its future supply of raw material could be assured, it would take the place of the Great Southern sawmill in Bogalusa if some part of that sawmill could not be perpetuated. About this time A. C. Goodyear (now chairman of the board of Gaylord Container Corporation) and R. H. Laftman (former manager of the paper mill) visited the forests of Sweden. W. H. Sullivan visited the forests of Hardtner at Urania, La. They were all interested in what they saw, and enthusiastic as to the possibilities of growing a second crop of pine trees on their denuded cut-over lands. Sullivan couldn't wait to get started. Foresters who were consulted, Austin Cary, Wilbur Mattoon, and others, advised him to go slowly and with caution as there were few precedents for guidance. Caution was one thing about which Sullivan knew very little. One either did things or one didn't.

If they were done, they were done right now and on as large a scale as possible.

The forestry operation was started in the winter of 1920-21 with the full approval of the directors: 800 acres were fenced, beds were prepared, and loblolly seed was planted. At the same time, fire protection was established on 5,000 acres and seed trees were marked to be left on lands being logged. The "Tango" at the sawmill was shut down and skidder crews were told to protect the small trees or get out of the woods.

The Forestry Department was headed, not by a professional forester, but by a popular, well-liked native son of Louisiana, J. K. Johnson. Mr. Johnson, not being a professional forester, had no predetermined yard stick by which he could measure his success or failure; and, there were plenty of incidental failures. A less determined man would have become discouraged. The loblolly pine seed on the furrows, germinated and grew, and much to everyone's surprise survived the summer. Today although far from perfect, these trees stand as a monument to the first commercial hand planted forest of the South. The trees on the area being logged and under fire protection bore a bumper crop of seed—so large, in fact, that seed was collected by picking it up in large cake pans where it drifted up along the roads. The following year 1921-22, 2,000 acres were direct-seeded and 380 acres were planted with loblolly wild stock, 5,000 more acres were put under fire protection, and seed trees were marked and protected. Ninety acres of the previous year's plantation burned, at a total loss. The 2,000 acres direct-seeded was a 98 percent failure, but the 380 acres of wild stock plantation was successful. Again, trees on the area being logged bore a bumper crop of seed, and reproduction was established on this land.

Tools for planting were few and primitive. The first planting dibbles were worn out Model T Ford axles and broom handles; fire tools were ordinary garden hose, rakes, and long handled shovels, and a pine top if one could be found. Austin Cary remarked that if these plantations survived "forestry was fool proof in the South."

Progress was being made; but not fast enough for Sullivan. He demanded and got 1,200 acres planted to wild stock loblolly in 1922-23. Naturally re-seeded lands were being purchased, fire protection was expanded, a pine nursery was established, still it was not fast enough. Planting expanded: 4,600 acres in 1924-25, 6,500 acres in 1925-26, 7,000 acres in 1928-29. Management plans were made. Two expeditions to Central America, one to Nicaragua and one to British Honduras, sought timber to be brought to Bogalusa to prolong the sawmill's life. Redwood logs were brought from the West Coast to be cut into lumber at Bogalusa. A planned reduction of the mill capacity was made—from 200,000,000 to 90,000,000 board feet annually on January 1, 1929.

Planting continued, with planting stock produced in the company's nursery through the season of 1930-31. In 11 planting seasons, 30,000 acres of denuded, devastated, cut-over lands had been brought back into forest production, and 120,000 acres of naturally re-seeded lands had been purchased and protected from fire.

After October 1929 the economic depression altered the program. In 1931 the nursery was closed and planting discontinued; but fire protection was continued. Mr. Sullivan had died in February 1929, and the former assistant treasurer, D. T. Cushing became general manager. Again, it took men of courage to guide our project through those troubled times. The Central American projects were not attempted, but redwood was brought from the West Coast and manufactured in the sawmill at Bogalusa. This proved to be costly and not economically sound and was discontinued. The sawmill operation was reduced from 20 hours a day to 8 hours, with production dropping from 200,000,000 board feet a year to 90,000,000. It soon became apparent that this huge mill could not be operated economically at this reduced capacity.

Now came the necessity for courageous decisions, and as before the men of courage and vision were willing to make them. The sawmill was to cut out its remaining over-mature longleaf pine timber and be liquidated. The pulp and paper mill was to be expanded to take up the shock. All purchased second growth lands, all planted lands, all cut-over lands as well as the management and administration of these lands were transferred to the Bogalusa Paper Company early in 1935. Planting was resumed in 1936; cut-over land was taken over from Great Southern as fast as it developed; and fire protection was expanded and intensified.

The last log passed the head rigs on April 20, 1937, and the carriage was locked by the hand of Ben Sellers, the same sawyer who 30

years before had cut the first line. It was a sad day when the boiler fires were banked and the "wild cat" sounded for the last time. Without the ever present men of courage, vision, and stature this might have been the end of the story.

In 1937 came the consolidation of Robert Gaylord, Inc., and Bogalusa Paper Company. From this union came Gaylord Container Corporation. Now there was to come to Bogalusa, Vertrees Young, executive vice-president, of the new corporation, pleasant, mild-mannered, medium stature, red-headed, Dutch descent, a graduate of M.I.T. I have never known a more pleasant, a more capable, or a more sincere man. Never since his arrival has the forestry operation moved fast enough to suit him. The forestry operation consists of total land holdings in fee of 425,000 acres, in four blocks, all within 100 miles of the mill. Total planted area through the season 1950-51 now amounts to 67,950 acres and plans call for planting 28,500 acres in the next three years. All lands are under intensive fire protection in cooperation with the Louisiana and Mississippi Forestry Commissions.

All lands have been completely inventoried by company personnel, using our own airplanes, aerial cameras, photographic laboratory and interpretative equipment, volume tables, growth data, and projections by type and by parish or county.

Written management plans, cutting budgets, and operational schedules have been determined and are in effect on the entire 425,000 acres. A total of 600 miles of fire line and 500 miles of operational roads have been constructed. Preparations have been made for cutting and inspecting the cut of 103,000 cords of pulpwood and 11,650,000 board feet of pine sawtimber and piling, and 20,000,000 board feet of hardwood sawtimber annually. Cull hardwoods are being removed on 3,000 to 5,000 acres annually. Insect control by spraying and timber salvage is being carried out. This is the work of a forestry staff of 24 graduate foresters.

Following our present forest management plans we will build up the forest inventory so that by 1960 we will be able to supply 70 percent of our mill requirements from company lands. While our sawmill has passed into the realm of memory, our pulp and paper mill has grown from 100 tons a day to a capacity of approximately 1,000 tons a day.

And so, at Bogalusa we have built a new industry on cut-over land!

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The Place of Fire in Southern Silviculture[1]

A. D. Folweiler
Texas Forest Service, College Station.

THE PRACTICE OF SILVICULTURE in the South[2] is relatively new. Before 1925, only two national forests existed in the coastal plain. Both were in Florida. They were residue of the public domain. The office of state forester in a southern state was first established in Virginia in 1914. This was closely followed by the creation of similar offices in North Carolina and Texas in 1915. The Southern Forest Experiment Station of the United States Forest Service, for example, was established as recently as 1921. The investigations of the Appalachian Forest Experiment Station were not extended to the piedmont and coastal plains until 1927. The foresters in the region in 1925 were concerned almost entirely with preaching the gospel of complete fire protection if in state forestry organizations, with logging if in private employ, and with becoming familiar with southern ecology if in a public research organization.

With very few exceptions, the graduate foresters in the region 25 years ago had attended forestry schools that were dominated by European influence, i.e., the silviculture of forest types of the cooler climates of the temperature zone. This meant that fire should be excluded entirely from the forest except when used for slash disposal. Approximately four out of five fires in the United States occurred in the South. Each southern state forester set out to convince the public that forest fires were a public menace. From 1928 through 1930, the American Forestry Association, through its Southern Forestry Educational Project, endeavored to awaken the people of Florida, Georgia, and Mississippi to the damage that forest fires were doing to the local economy. The project was an excellent aid to state forestry organizations in their mission to curb wild fires in the piney woods. Gradually the public came to associate forestry with the control of forest fires; but silviculture and intensive forest management were seldom mentioned, because forest fire control was a prerequisite. Tolerance of wild fire had become a southern tradition. It is quite understandable that it was difficult to alter the point of view in only a few years.

Discovery of the South as a Major Forest Region

The South was by no means unknown to a few foresters before the Thirties, but only a very few of them were well informed on its characteristics and potentialities as a timber growing region or on the culture of the indigenous population.

In 1908, Yale School of Forestry students were introduced to south-

[1]Paper presented at the 51st annual meeting, Society of American Foresters, Biloxi, Miss., December 15, 1951.

[2]The term "South" in this paper is used in a narrow sense in that it applies to the piney woods of the coastal plains and Piedmont. It excludes the southern Appalachians and the Cumberland Plateau.

ern forests on the John Kaul property in Alabama. Here they learned about the southern pines and the environment that made possible mayhaw jelly and restless nights dedicated to scratching redbug and tick bites. In that same year, Professor H. H. Chapman observed the unusual behavior of longleaf pine when exposed to fire. Subsequent to 1908, it became part of the Yale School of Forestry curriculum for its students to spend several months in the South prior to graduation. This gave Professor Chapman the opportunity to make continuous observations about southern pines. These observations were later embodied in his publications on longleaf and loblolly management. In 1915, S. T. Dana, then with the United States Forest Service established at Urania, La., what have become the famous Roberts plots discussed in David Bruce's paper in a 1947 issue of the JOURNAL OF FORESTRY (*2*).

It had been traditional in the coastal plain country to practice "light burning" or what was known colloquially as "swingeing off." This practice reduced the hazard to "faced" trees created by fuels that accumulated on the ground, supplied the cattle that grazed in the forests with early grass so badly needed after greatly reduced forage during the winter, kept the woods open so that game could readily be hunted, made it quite easy to find pine knots for fuel, and allegedly reduced the tick population. The large landowners were unopposed to the time-honored practice because they were interested primarily in complete liquidation of invested capital by removal of the timber and selling the land for farming. In brief, there was very little serious effort exerted in producing timber as a crop in the South approximately a quarter of a century ago.

Within the pine types of the coastal plain, foresters became aware of the implications of complete fire protection in the flatwoods country where longleaf dominated the ridges, where slash pine had been driven by frequent fires into the ponds, and the prevailing forest economy was the production of naval stores. In the traditional burning of the turpentine woods there was seldom any attempt to confine the fire to a specific area. The Osceola National Forest in northern Florida became a national forest in 1931. It is situated in the heart of the naval stores country. It was here that the foresters responsible for the administration of the Osceola became aware of the aggressiveness of slash pine when fire is controlled. But it was here as well as in other parts of the naval stores belt, that foresters learned that with fire control the accumulated fuels made fire control almost impossible under the weather conditions that occasionally occurred. Here is where foresters first took a leaf from the book of those who had been working in and observing southern forests for many years; they came to the conclusion that fire probably had a place in the management of longleaf and slash pine if only because the cost-benefit ratio favored the use of controlled fire as a means of reducing hazard. Thus the cycle in the naval stores belt was complete: numerous fires; attempted complete elimination of fires; and now, the use of fire as a tool in forest management.

That fire had a place in the management of longleaf pine had been expressed for many years by Professor Chapman. He made this statement as early as 1912 in *American Forestry* (*4*). In a Yale School of Forestry publication dated 1926, Professor Chapman (*5*) stated that fire can and should be used in silviculture as applied to longleaf pine. In 1935, the JOURNAL OF FORESTRY published a paper by E. L. Demmon (*7*) that conceded that fire had a place in silvicultural practice in the longleaf region. Because of his position as director of the Southern Forest Experiment Station, Demmon's paper was acknowledgement by the U. S. Forest Service that controlled fire has a place in the silviculture of longleaf pine.

The Use of Fire in Longleaf and Slash Pine Areas

As a result of more than two decades of intensive administration of forest land, many southern foresters now accept fire as having a definite place in pine forest management in the longleaf-slash areas for (1) hazard reduction; (2) reproducing the stand by creating a mineral seedbed that is favorable for the germination of pine seeds; (3) controlling brown spot of longleaf seedling; (4) controlling small undesirable hardwoods that, if unmolested, would inhibit the development of pine reproduction; and (5) producing legumes as bird food.

The economics of the management of southern pine forests has forced many foresters, perhaps reluctantly, to admit that controlled or prescribed fire has a very definite place. If it were economically superior to remove heavy accumulations of grass and litter, control brown-spot disease of longleaf seedlings, and have pine reproduction develop into sapling stands without the use of fire, then fire should be excluded from the forests. Accumulated rough can be removed by heavy discing or bulldozing, but at a cost many times the cost for the same results obtained by use of fire. Bordeaux mixture will control brown-spot in longleaf seedlings, but the same results can be achieved by the use of controlled or prescribed fire at much less cost. Herbicides can be used effectively for removing the competition produced by undesirable hardwoods that overtop pine seedlings and saplings, but it has been proved that small hardwoods of 2 inches or less in diameter can be deadened by the use of controlled fire at a cost much less than the cost of poisoning.

In the naval stores area, where longleaf and slash pine dominate, prescribed burning has been accepted as a standard practice in the management of national forests. Some private landowners follow the same practice. The chief motivating factor in its adoption has been hazard reduction. Other objectives are the control of undesirable hardwoods and the preparation of a mineral seedbed.

The results of several years of research and experience in the de-

velopment and use of prescribed fire in the naval stores belt are set forth in considerable detail in a paper by C. A. Bickford and L. S. Newcomb (*1*) published in 1947. In the same year the JOURNAL OF FORESTRY published a paper by John W. Squires (*8*) on the manner in which fire was used to reduce the hazard on national forests in Florida flatwoods. It may be regarded as a supplement to the publication by Bickford and Newcomb. The emphasis of both papers is on prescribed burning for hazard reduction.

Use of Fire in the Pine-Hardwood Types

In the coastal plain of the Carolinas, Mississippi, Louisiana, Texas, and Arkansas, longleaf and slash pine are of less importance than in the naval stores belt; here loblolly and shortleaf pine, in pure stands or in mixture with a few or many upland hardwoods, are the dominant species. Here the motivating influence for the use of prescribed fire is the preparation of a mineral seedbed and the control of undesirable hardwood trees and low forms of vegetation.

In 1942, the Yale School of Forestry published H. H. Chapman's (*6*) ideas on the management of loblolly pine west of the Mississippi River. Professor Chapman emphasized the use of fire for the preparation of a seedbed suitable for the germination of loblolly seed and subsequent burns for keeping the associating hardwoods under control. The emphasis was on silviculture, not on hazard reduction.

In 1949 the Southeastern Forest Experiment Station published Chaiken's (*3*) findings on understory hardwoods in the loblolly forests in eastern Virginia. Here again, the emphasis in the use of fire was not for hazard reduction but as a silvicultural tool for the control of hardwoods that compete with the development of pine.

There is still much to be learned about fire behavior in the coastal plain pine types other than longleaf and slash. In a region as large as the South, extending from the Potomac in Virginia to the Brazos in Texas, it would be taking too much for granted to conclude that what applies in the Carolinas is equally correct in Louisiana and Texas. The Southern and Southeastern Forest Experiment Stations and at least one state forestry agency are now studying fire behavior in the pine-hardwood types. The major purpose is to develop fire as a silvicultural tool especially useful in the establishment of pine reproduction and in control of undesirable hardwoods.

In the oldest observed area in the region, the Roberts Plots at Urania, La. (*2*), complete exclusion of fire has resulted in the establishment of loblolly and shortleaf pine, along with longleaf. There is also a heavy undergrowth of lesser vegetation that will inhibit reestablishment of longleaf when the pine overstory is ready for reproduction. This is in contrast to the adjoining area that was burned annually where longleaf now dominates almost to the exclusion of loblolly, shortleaf, hardwood species, and associated brush.

Prescribed Fire and the Public

Man has thoroughly domesticated fire in the household. Infrequently it gets out of hand, but we continue to use fire, in spite of occasional conflagrations, because we find it most useful to do so. Techniques have been developed, or are in process of development, that will make fire a servant rather than a master in the forest as well as in the household. If the public requires re-education of the place of fire in the southern pine forests, then foresters should be first to admit the need and do those things necessary so that the public will understand the difference between wild fire and prescribed fire.

Forest managers of some privately owned land are fearful that once the public becomes aware that foresters are deliberately setting fire to the woods, there will again be apathy by the public toward forest fire control. It is alleged that public sentiment may no longer hold in check the chronic woods burners; a new crop of incendiarists may even be developed. It must be admitted that there is a certain amount of such risk in the use of fire as a silvicultural tool. Public sentiment toward fire control, coaxed for a quarter of a century to its present stature, must be preserved. In other words, the public must be educated to the fact that prescribed burning is a form of forest fire protection just as is the suppression of all wild fire. But for foresters to ignore the usefulness and economy of prescribed fire as a device in forest management is merely to delay the development of a useful and low-cost technique. Those responsible for forest management where fire is a necessary silvicultural tool have the obligation to take the time and patience to explain to the people who reside in communities where burning is to be done, just what the intent of prescribed burning is. Those who do prescribed burning without taking the time to inform the local people of what is going on are delinquent in their public relations.

There is some question about using fire for hazard reduction purposes in any type other than longleaf and slash. It is much more difficult to obtain a satisfactory prescribed burn in loblolly and shortleaf stands than in longleaf and slash, because of the character of the fuels. Today, no southern state forestry organization considers that fire should be used in the pine-hardwood types for hazard reduction purposes.

The Task for the Immediate Future

It is just as necessary today that there be forest protection from wild fire as was the case in 1924 when the Clarke-McNary Law was enacted. Pine forests cannot reproduce themselves unless there is complete protection from fire in the period between seed germination and the development of a sufficiently thick corky layer at the base of the trunk to resist even a fast-moving, cool surface fire. The fund of knowledge of fire behavior is progressing to the point that foresters are developing and have developed techniques with fire. They have fashioned a silvicultural tool that can be used if,

as, and when silvicultural practice requires it and public sentiment will tolerate its use.

It is now necessary to educate the public that there is a place for prescribed fire in applied forestry for southern pines. The use of fire in the forest requires a great deal of skill. This was very well summarized by Arthur W. Hartman, chief of fire control in the Southern Region, U. S. Forest Service who stated, in referring to prescribed burning, that it is "—the application of fire to land under such conditions of weather, soil moisture, time of day, and other factors as presumably will result in the intensity of heat and spread required to accomplish specific silvicultural, wildlife, grazing, or fire hazard reduction purposes" (*1*). Any fires set without a definite objective and without the benefit of intimate knowledge of fire behavior can very easily produce disastrous consequences. As part of the public education process, it is necessary to inform the public that only qualified persons should practice prescribed or controlled burning. Very few persons are qualified to do prescribed burning! It is an act that requires expert knowledge.

The state forestry organizations have close contact with the public, especially forest landowners. It would seem good policy for each state forestry organization to have its field personnel receive first-hand experience with prescribed burning, with all its complexities, so that the men can become informed of its usefulness as well as the dangers involved. The message of prescribed burning must be carefully, clearly, and repeatedly presented to the local forestry personnel so that they may carry the message, with all its ramifications, to the people with whom they associate. The time is not far away when the techniques of prescribed burning will be as well established for the pine-hardwood types as is now the case for the longleaf-slash type. While the techniques are being developed and perfected, each state forestry organization can take advantage of the interlude to educate the public to the fact that fire, under very specific conditions, serves a useful purpose in the pine forests, but unless very carefully used, can easily produce most unfortunate results. In brief, the control of wild fire and the use of prescribed burning in southern pine forests both contribute to good forestry practice. The sooner the public can be educated to this, the greater will be the opportunity to practice some forms of low-cost silviculture without adverse public reaction.

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Aircraft Scouting for Pole Blight and Oak Wilt[1]

Marvin E. Fowler

Senior pathologist, Division of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Md.

DURING THE SUMMER of 1949 the Division of Forest Pathology initiated its first organized forest tree disease surveys with funds provided by the Forest Pest Control Act. One of these was for pole blight of western white pine, in the Northern Rocky Mountain Region. Pole blight is a killing disease, attacking principally the pole-size white pines of 40 to 100 years of age. The extremely rough terrain of the region and inaccessibility of many areas made scouting from automobiles and on foot unusually difficult. Some of the external symptoms of pole blight, yellowing and sparseness of foliage and shortening of needles and of terminal branches, are recognizable at long range.

For this reason it was believed that low-flying airplanes might be used to locate pole-blighted stands. On the initial flight over a diseased stand on August 11, 1949, we found that at an altitude of 500 feet or less above the tree tops, we had no difficulty in recognizing pole stands of western white pine or in distinguishing between healthy ones and those with symptoms of pole blight.

We made subsequent flights during 1949 and others in the summers of 1950 and 1951. We have now flown over all the major pole-size stands of western white pine in northern Idaho and adjacent Washington and Montana. In 1949 we used both the Piper and Stinson airplanes, and in 1950 and 1951 we used a Curtis Air Sedan under contract with the U. S. Forest Service. All three types of planes were satisfactory, but the more powerful Curtis is safer to use.

We inspected drainages containing pole stands of white pine on the contour, by flying along ridges, then dropping down the slope about 500 feet for each successive tour. For the most part, flights were made in the early morning hours while the air was calm and before heat thermals created bumpy conditions and hazardous flying over rugged wilderness areas. Suspected pole-blighted stands were inspected at close range, from 150 to 200 feet, when flying conditions permitted. At other times field glasses were used effectively to inspect trees.

Symptoms of white pine blister rust, also prevalent in the area, can be distinguished from pole blight symptoms.

Yet pole blight cannot be definitely determined from the air. It is necessary to examine the stands on the ground to determine if the symptoms seen from the air were caused by the blight or from some other condition such as logging injury, sun scald, or unusual retention of old yellowed needles. Some symptoms of pole blight, flat faces on the boles, and lesions, usually long and narrow, under the bark on the main stem from which frequently there has been a copious resin flow, are not visible from an airplane and must be checked on the ground.

Good mapping work is therefore an essential part of the aerial observers' duty. After a suspected diseased stand is seen from the air its location must be accurately indicated on a map so that a ground crew may complete the examination. Large-scale contour maps issued by the U. S. Forest Service have been most useful. Usually there has been little difficulty in indicating the position of the diseased stands within its proper drainage. The sparsity of roads and trails in some areas has made it difficult to locate some stands on the ground. In one or two instances, when landmarks were absent, we resorted to sending the plane out a second time, after stationing two ground crews at points where they could see the airplane over the stand. The plane then circled the area, rocking its wings as it passed over the diseased trees, and the two ground crews took compass bearings so that through triangulation the stand could be accurately located.

Airplane scouting for pole blight has enabled a few men to inspect a large area of inaccessible forest stands in a comparatively short time. We have inspected approximately 750,000 acres of pole-size stands and found that almost 10 percent of these had from moderate to severe pole blight. Some older stands were also inspected from the air. We flew about 25,000 miles in conducting this survey and found the disease in the United States from several miles north of Metaline Falls, Wash., or within about eight miles of the International Border, southward in northern Idaho and adjacent Washington and Montana to Disalto Creek, Idaho. This southernmost known infection is in the St. Joe area, only about 35 miles north of the Clearwater area, which is famous for its valuable stands of western white pine and from which about 70 percent of the saw logs of this species are cut. The disease also occurs north of Idaho in Canada, and during the past summer Canadian pathologists found it in the Pacific coast area in British Columbia.

Since we started our survey for pole blight, we have observed the disease spreading and intensifying in some areas. In one 60-year-old stand, growing on an excellent white pine site, as much as 80 percent of the dominant and co-dominant trees have been found to be diseased, with a mortality in these classes of approximately 20 percent. We have also found the disease on trees up to 165 years old. With the discovery of pole blight on the coast in British Columbia, we need to determine if it is also

[1]Paper presented at a meeting of the Division of Forest Management, Society of American Foresters, Biloxi, Miss., December 14, 1951.

present in our coastal area, and if it attacks other five-needle pines.

Oak Wilt

During the last few years, pathologists and foresters throughout the eastern half of the United States have been alarmed by the discovery of oak wilt in new areas. This disease affects every oak species tested so far, some 27 species, and has also been found in a plantation of Chinese chestnuts.

The disease kills red and black oaks rapidly, usually during the season in which the first symptoms appear. White oaks are not as severely affected and the disease may kill them branch by branch. Sometimes oak wilt can be pruned out of a white oak by removing affected branches. For several years oak wilt was only known to occur in Wisconsin, Iowa, Minnesota, northern Illinois, and northern Missouri. Oaks had been dying in this area for many years. Some pathologists and others observing the disease wondered why it was not found in other areas, and many began to hope either that the disease was climatically limited or that its possible vectors were present only in that area. These false hopes were suddenly shattered in the summer of 1949 with the finding of oak wilt in southern Missouri. Here the disease was in an entirely different climatic zone and in the northern part of a vast oak forest region that extends southward almost to the Gulf of Mexico. Oak wilt was suddenly recognized as one of the most important problems in forest pathology. Oaks, which produce a third of our hardwood saw logs in the United States and which are also exceedingly important as shade trees and as ground cover, were threatened by this disease.

We initiated our survey for oak wilt in the summer of 1950. This disease also lends itself to preliminary scouting from low-flying airplanes. Oak wilt produces very noticeable leaf symptoms, which vary with the oak species affected. Early symptoms may be limited to a wilting and bronzing of foliage only in the upper crown, usually followed by wilting and bronzing of the foliage throughout the crown, beginning at the top and ends of lateral branches and accompanied by partial defoliation. In a more advanced stage the majority of the leaves are dead and defoliation is more pronounced. In some cases very little defoliation may occur when a tree dies very rapidly. Some leaves may stay on the tree to the end of the season and a few may even persist until the following summer. The bronzing of scarlet oak leaves usually begins at the apex and lobes of the leaf blade, spreading to the midrib until the entire leaf blade is involved. The leaf surface near the midrib frequently has a water-soaked appearance before bronzing. Affected leaves in any stage, including those that are fully green, may fall from the tree. Sprouting along the trunk and larger branches frequently occurs before an infected tree dies. Small trees do not escape from oak wilt.

In July 1950 we made flights over a known oak wilt infection in southeastern Missouri. Healthy and diseased oaks were readily distinguished in the forest stand, even at considerable distance. Therefore we used airplanes of various types during the remainder of the 1950 season for the survey in southern Missouri, in Arkansas, and in western Kentucky and Tennessee. Most of the flights were made at 100 to 200 feet above the tree tops. Flights were made in strips about 50 miles apart. The observations were more or less limited to areas readily accessible from passable roads. This enabled the ground crews to examine more easily the suspected trees. Nevertheless, most of the trees spotted by the aerial observer would not have been visible from an automobile on the nearest road.

One observer in a light airplane can survey about 17 or 18 square miles of forest land per hour. Two observers can survey approximately twice that area.

In an airplane 200 to 500 feet above the tree tops the observer has a better view of the tree crown than is usually possible on the ground unless he is directly beneath the diseased tree. Frequently a wilted tree shows up better from the air than from the ground. Often the early symptoms are seen from the ground as a narrow and indistinct border of discolored leaves against the sky, whereas if seen from an airplane these discolored leaves in the upper crown may appear as a large brilliant spot in contrast to the green of the surrounding crowns of healthy trees. The understory trees can be seen best when flying from 100 to 200 feet above the tree tops. Oak wilt foliage symptoms are most conspicuous from mid-June to early September. Some trees may develop symptoms earlier and most can be distinguished in the fall until the normal autumn foliage colors begin to develop.

While it is easy to distinguish discolored from healthy green foliage from a plane, it is not always easy to distinguish between oak-wilted trees and trees dying from some other causes. Perhaps the most confusing symptoms are those induced by lightning strikes and by poisoning and girdling. In both these instances the tree may die suddenly while in full leaf. The leaves on such trees become brown over the entire surface, and very little or no defoliation takes place until near the end of the season. By contrast, oak-wilted trees are usually not as brown because parts of leaf blades may remain green. Also, oak-wilted trees may undergo partial defoliation and the crowns may appear thin by comparison. A careful observer soon feels that he is able to recognize oak wilt with reasonable accuracy. However, to be certain that oak wilt is present in a new location, it is necessary to culture the causal fungus from material collected from the suspected tree.

Airplane scouting for oak wilt enabled a few men to inspect a much larger forested area in a few weeks than would have been possible in many months on the ground. Areas that did not contain wilted trees were eliminated from further consideration. It is often necessary to make an almost 100-percent cruise of a dense forest

to find scattered wilted trees that could be seen almost at a glance from a low-flying airplane. When a suspected tree or group of trees is seen from the air, the observer marks the location as accurately as possible on a map and relates it to landmarks that can be recognized by a ground crew. Large-scale county highway maps have been very useful in this work. In conducting a survey to determine if the disease is present in an area, the ground crew needs to visit only selected suspected trees to collect specimens for culturing.

Relatively low-speed (80-plus miles per hour air speed) aircraft, such as Piper, Stinson, Aeronca, Luscombe, and Cessna, are satisfactory for survey work. The plane must be so constructed that the observer will have a good view of the forests. Helicopters would be very satisfactory also for some types of scouting and they have been successfully used at the Cook County Forest Preserve in Illinois. The hourly rental for this type of plane has been higher than for others and its slow speed is not deemed essential to some types of scouting.

The most satisfactory airplane that we have used in our oak wilt surveys is a government-owned and operated Cessna 195. This plane was powered with a 300-horsepower engine and had a variable pitch propellor, which enabled it to climb at a very much faster rate than the other planes used. The rate of climb is important for getting off small airstrips, out of narrow valleys, and over steep ridges, powerlines, radio towers, tall trees, etc.

Spread of Oak Wilt

The disease was found to be spreading actively in southern Missouri in 1950 (Fig. 1). Numerous recently diseased individual trees were found in otherwise healthy stands. One of the infected areas found in southern Missouri in 1949 was near Poplar Bluff, in the southeastern corner of the state. A 160-acre tract around this infection center was cruised in 1950 and nine separate and distinct infection centers were found. These nine centers were readily visible when a flight was later made over the area. Oak wilt had been present in the oldest center for about 8 to 10 years. We also found the disease in six counties in Arkansas, the southernmost being near Booneville, in Logan County.

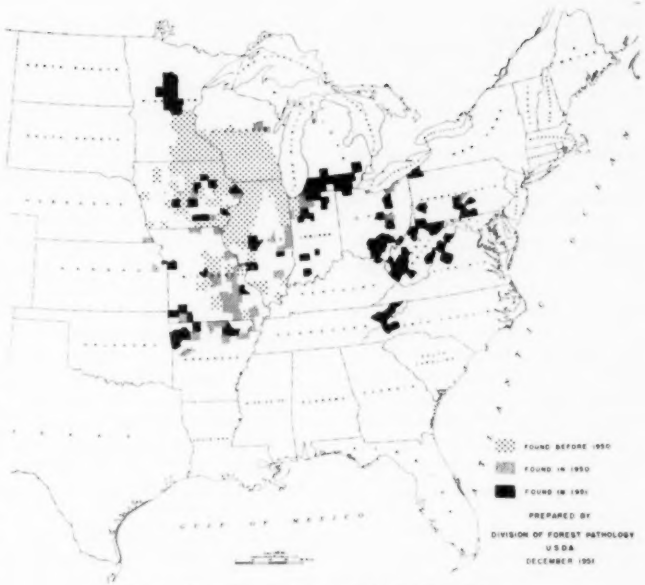

FIG. 1.—Distribution of oak wilt in the United States.

In 1950 other investigators found oak wilt in Richardson County, Neb.; in Douglas County, Kan.; in Lake, Cuyahoga, and Coshocton Counties, Ohio; and in Mifflin County, Pa.

It became apparent that the Division of Forest Pathology could not conduct all the surveys needed to determine the range of oak wilt. Officials were contacted in each state where oaks are important, to solicit their cooperation. The division conducted surveys in three distinct areas, however. Southern Missouri, Arkansas, and western Kentucky and Tennessee were assigned to one group. Western Mississippi and eastern Louisiana were assigned to another group, and the third crew conducted a survey in western Virginia and North Carolina, eastern Kentucky and Tennessee, and a portion of northwestern South Carolina.

In 1951, almost every state throughout the oak range alerted its forest workers. The U. S. Forest Service alerted its foresters in these areas. A number of commercial firms and forest owners also searched for the disease. City shade tree officials and operators of tree care organizations cooperated. In addition, a number of states conducted organized surveys and others plan to initiate surveys during the coming year.

Arkansas cooperated in the survey conducted by the Division of Forest Pathology by furnishing airplanes for surveys over state forests. Surveys were continued in the Lake States where oak wilt has been known for the longest time. Illinois increased survey activities. The Cook County Forest Preserve was resurveyed last summer. Texas surveyed approximately 10 percent of its Region 1, consisting of the 10 northeastern counties, using an airplane for the preliminary work. Indiana increased its search for the disease and employed one man to devote the summer to this work. Michigan conducted a survey over the three southern tiers of counties in that state, using an airplane for preliminary work. Ohio searched

for the disease with a state-owned plane. New York initiated an airplane survey in the southern part of that state. Pennsylvania conducted a limited airplane survey. New Jersey, Massachusetts, and Maryland searched for the disease and a limited survey was made in western Maryland from airplanes. West Virginia surveyed about 10 percent of the state with an airplane. South Carolina cooperated with the Division of Forest Pathology by furnishing an airplane for several days. Georgia had foresters visit each fire tower in 40 counties to search for the disease. Rhode Island made a complete check from an airplane. The Tennessee Valley Authority intensively scouted several counties in eastern Tennessee.

As a result of these survey activities, oak wilt has been confirmed by cultures in the counties shown on the oak wilt distribution map (Fig. 1). The disease was found in seven additional states this year: Michigan, West Virginia, Virginia, Maryland, Kentucky, North Carolina, and Tennessee, and in numerous counties for the first time.

A knowledge of the distribution and intensity of oak wilt alone is not enough to determine if the disease is actively spreading into new areas. This information needs to be supplemented with a knowledge of the age of the various infections. The oldest infections in the Ozarks and in the Appalachians are much younger than those in the Lake States and it now appears that the disease has been moving southward and eastward.

Those observing the disease should endeavor to determine the age of the infections and it would be appreciated if they would send this information to our division. This information will be an important factor in the consideration of control measures.

The means by which the oak wilt fungus spreads from one location to another to establish a new infection center is not known. The pattern of spread does not suggest wind-disseminated spores, but it is not known if it is spread by this means or by some insect, bird, rodent, or other means. Until we understand how this is accomplished we have no basis on which to recommend measures for control of this type of spread. Sanitation through destruction by burning of diseased trees has been suggested.

A. J. Riker and his associates in Wisconsin found that local spread of oak wilt that resulted in an enlargement of an infection center was accomplished by the transmission of the fungus underground, through the natural root grafts that commonly occur between oaks of the same species growing close together. Thus the disease may spread in a more or less circular pattern from the diseased trees to a few or a considerable number of the surrounding healthy trees. In five or ten years a pocket of dead trees from ⅛- to 1-acre in extent commonly develops.

The spread of the disease through root grafts may be stopped by poisoning the healthy trees in a zone 50 feet beyond the perimeter of the diseased trees. Sodium arsenite and Ammate have been used. Great care must be exercised when using sodium arsenite because the chemical is attractive and poisonous to animals. Ammate does not kill trees as rapidly as the arsenite, but is safer to use. Chemicals sometimes not only kill the poisoned trees but also others that are connected to the treated trees by root grafts. This control method may be undesirable on some street, lawn, or park trees. Mechanical severance of roots connecting diseased and healthy trees has been successful in preventing spread of the disease. A cut 30 inches deep will sever practically all of the connecting roots between trees.

In the Lake States, two power tool methods have been successfully used to sever connecting roots between trees. Noel Wysong has used a trenching machine. Riker devised a plow with a knife blade, which makes a 30-inch deep slice in the soil without digging a trench.

The spread of the disease into a new area on transplanted infected small trees is a possibility, but we have no definite information on this subject.

There is little likelihood of spreading the disease on lumber without bark or sapwood cut from infected trees. The fungus is usually confined to the recent annual rings and would be largely removed when logs are cut into lumber. We have no evidence that the oak wilt fungus can be spread from such material. The fungus has been isolated from the outer rings of logs a year after cutting, and from stumps two years after trees were killed by oak wilt.

With oak wilt now having been found over so large an area, and the possibility that it may eventually spread throughout the oak range, pathologists, foresters, and timberland owners are confronted with the question "What should be done about oak wilt?" Oak wilt has not been present in the Ozarks or the Appalachians sufficiently long to permit an estimate of the annual drain or potential damage it may cause. Last August, I made a trip to Wisconsin and Iowa to inspect oak forests in which the wilt has been present for two decades or longer. Most of the oaks in these states are in wood lots of various sizes and are surrounded by agricultural lands. The forests in many other sections of the country might be more conducive for the spread and development of the disease, although nothing is now known regarding the possible effect of different climates. In one plot in southern Missouri one 7-inch black oak contracted wilt late in 1950. In June 1951 there were 33 additional wilted oaks within a distance of possible root-graft transmission and two more oaks wilted by the end of August. These 35 trees that became diseased in 1951 were black, scarlet, northern red, and southern red oaks of from less than an inch to 17 inches d.b.h.

Oak wilt has caused considerable damage in many oak woodlots in Wisconsin and Iowa. In some areas of from a few to 80 or 100 acres the mortality from this disease is 50 percent or more. On red and black oaks the wilt kills the stump and roots, and stump sprouting cannot take place. Back of the advancing front of the disease as it creeps through the forest may be

almost barren areas that once were populated with oaks. Many woodlots are still free of the disease and I would roughly estimate that there has been about 5 percent mortality of oaks during the past 20 years in the southern half of Wisconsin. It is hoped that we may secure data for a more reliable estimate next summer.

The threat of oak wilt appears to be very real. If left unchecked, oak wilt may eventually spread over the entire eastern half of the United States. If nothing is done about it, the wilt may spread through the vast oak forests of the Ozarks and the East as it has through some of the woodlots in Wisconsin the past 20 years. With a long-rotation crop such as oak, who knows what the drain may be with wilt present in a stand for a hundred, or even fifty years?

Much research has been conducted on oak wilt but much more remains to be done. It is of primary importance to determine how the disease spreads a considerable distance from the infected area to healthy trees. This knowledge might provide a basis for the development of better control measures.

The information obtained during the past year on the distribution of oak wilt has not only revealed that the disease is far more widely dispersed than previously known, but also that we do not know just where it may be. Consideration of wide-scale control, or attempts to estimate the importance of the disease and forecast its future progress must be based upon a more complete knowledge of its distribution and intensity than is now available.

Our present knowledge of oak wilt, the slowness of local spread of the disease, the apparent absence of an efficient means by which the disease can make numerous and rapid jumps overland, all lend encouragement for control practices. It now appears that oak wilt can be brought under control in forests in any given area and new infections eliminated as they appear.

We will continue our survey for oak wilt in the summer of 1952, and we solicit your cooperation and ask that you report to us any oak wilt that you may find in new areas.

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Toward a Regional Program of Forestry Training and Research in the South[1]

William J. McGlothlin
Consultant for professional programs, Southern Regional Education Board, Atlanta, Ga.

IN MEMPHIS, TENN. and Greensboro, N. C. stand hotels which proudly bear the name, "King Cotton," symbols of the time when that traditional crop dominated the thinking of the region. But the South is also aware of its forests. At least 52 of its towns carry names made of southern pine, and any one of you, I am sure, can think of place names honoring other species, like Hickory, N. C., or Palm Springs, Fla., or the famous nuclear research center at Oak Ridge, Tenn. The general public in this region is beginning to recognize its dependence on an industry that produces as much as two-fifths of the lumber and about 60 percent of the pulpwood produced in the nation. It has looked with delight on the rapid growth of the forest products industries, particularly the dramatic expansion of pulp and paper mills. Anyone riding the South's highways can see the reflection of changing attitudes in the substantial efforts that have been made to reclaim eroded and virtually valueless soil by tree plantings—an effort which has expanded so rapidly that from 1944 to 1949, forest nursery production, in these states, grew from 16½ million to 200 million trees, or about twelve-fold in 5 years.

Even these advances by no means exhaust the possibilities both of improvements in forest practices and in better use of forest products. No one knows exactly how much the returns from the timber crop could be increased in these states. Estimates range from double to five times as much as the South is now receiving. The economic significance of those estimates is underlined by the fact the South now receives from three major forest industries—lumber, pulp, and furniture—more than four billion dollars annually.

In a field of such signifiance it is to be expected that professional practitioners will be needed. Beginning as early as 1898 at the Biltmore Forest School professional instruction has been conducted by a growing number of schools. The earliest forestry school remaining in continuous operation is that at the University of Georgia which began in 1906. At present the six schools or departments of forestry accredited by the Society of American Foresters are at the University of Georgia, Louisiana State University, North Carolina State College, the University of Florida, Duke University, and Alabama Polytechnic Institute. Twelve other institutions offer some work in forestry.

In common with many other professional schools in the region, forestry schools have suffered from lack of adequate support to provide high-quality instruction and research. The development of graduate and professional schools in the South has, for a number of reasons, lagged behind the development of similar schools in other regions. A study of graduate work made a few years ago showed, for example, that over the 10-year period from 1929-1939 southern institutions gave only 5 percent of the doctorate degrees awarded in the country. This should be compared, of course, with a population of approximately 25 percent. During the same period, Columbia,

[1]Paper presented at the 51st Annual Meeting, Society of American Foresters, Biloxi, Miss., December 15, 1951.

Chicago, and Harvard Universities each awarded more doctorate degrees than all southern institutions combined.

This slower development is reflected to some degree in the dates when forestry instruction was established as a separate school or department—Georgia in 1931, Duke in 1938, Florida in 1937, Alabama Polytechnic Institute in 1947, Louisiana State University in 1948, and North Carolina State in 1950. All these institutions had provided some forestry instruction prior to these dates, but they did not establish separate schools or departments in forestry until the need for greater concentration of effort in the field became apparent.

The South has in recent years become much more concerned with the development of graduate and professional training than it had been able to be in the past. It is finally convinced that the leadership and research it urgently requires can only come from expanded and strengthened graduate and professional schools located within its borders. Like all regions, however, it is faced with the hard and chilly fact that unit costs of university instruction increase rapidly as students ascend the scale of training toward graduate and professional instruction. To put it more simply—an undergraduate student may cost an institution some $200 to $400 each year; a medical student may cost ten times as much—anywhere from $2,000 to $4,000. Limited funds can be stretched only so far. Graduate and professional work obviously must rest on a firm base of high-quality work in elementary and secondary schools and in undergraduate instruction. Those fields cannot be robbed of support in order to strengthen graduate and professional schools. Substantial sums of additional money are required. The South is beginning to recognize this fact and will make at least part of the needed sums available. At the same time, however, it is attempting to assure itself that its expenditures are wise and necessary and that they will bring the greatest possible return. It has a unique opportunity to plan the development of graduate and professional schools on a much broader basis than it could were there now present a fully-developed system. It is clear, of course, from the actual development of graduate and professional schools that no state and no institution must necessarily provide for all fields. Six accredited forestry schools would appear to be an adequate number to serve most of the needs of the region, particularly if each is doing work of high quality. For other institutions to undertake professional work in that field would be to duplicate unnecessarily the facilities which are already available to the region.

The trick the South is trying is to plan graduate and professional education on a wider area than the constituency of a single university or the area of a single state. As universities consider entering new fields or expanding old ones, they can join with other institutions to determine essential contributions which each can make without needless duplication and with a concentration of resources which will make it possible to realize a high-quality of effort. This kind of thinking can apply both to instruction and to research so that offerings throughout the region dovetail with one another into what can become almost a seamless joint.

To aid institutions in this sort of planning the South, through the legislatures of 14 states, has set up the Southern Regional Education Board whose purpose is to "assist states, institutions and agencies concerned with higher education in their efforts to advance knowledge and to improve the social and economic level of the southern region." Furthermore the legislatures told the board to "explore fully, recommend, where desirable, and develop, where needed, interstate collaboration in the support, expansion, or establishment of regional services or schools for graduate, professional, and technical education." The board is composed of the governor of each state and three persons designated by him for set periods, at least one of whom must be an educator. In actual practice most of the persons appointed have been connected with education.

This regional education program, under the sponsorship and direction of the board, has first operated in the professional fields of medicine, dentistry, veterinary medicine, and social work. States which did not conduct professional schools in these fields contracted, through the board, with institutions in other states where such schools were conducted. The schools agreed to accept students from the contract states up to certain quotas. The states agreed to pay specified amounts for the privilege of sending students to these institutions. The students are not charged out-of-state fees, but pay all other fees. During the present academic year some 850 students are crossing state lines to attend 19 institutions. Pressures for the establishment of unneeded schools in the contract states have largely subsided. The potential saving to the region runs into millions.

One of the first areas proposed for the board's consideration was the field of forestry. A group of educators, acting as consultants to the governors early in 1948, before the board itself was established, listed forestry as one of the fields requiring early attention. As a result the board appointed the Commission on Forestry and Related Training in the fall of 1949 and received reports from that commission at its meetings of 1949 and 1951. The commission, headed by Dr. C. F. Korstian of Duke University, and composed of representatives of the forestry schools, the forest industries, and federal and state forest agencies, and the Society of American Foresters, was established for the following purpose: "To study forestry and related training in the South; to identify needs and problems; and to make recommendations to the institutions, states, and the board on action which will meet the needs and advance toward solution of the problems. In so doing, the commission will search for ways by which forestry and related training

can more effectively advance knowledge and raise the social and economic level of the southern region."

The commission held three meetings, did a great deal of research work, and reached a series of significant conclusions. It believed that the capacity of present accredited forestry schools is adequate to meet present student demand and needs of the profession for graduate foresters. It, therefore, recommended that institutions carefully consider needs before authorizing additional forestry schools. It emphasized the need for improved instruction in all the accredited schools. It proposed that "all institutions giving graduate work in forestry plan their offerings in light of regional needs and demands with as large an amount of institutional specialization as is consistent with sound educational practice."

When the commission came to the point, however, of identifying precisely the ways in which the different accredited schools might effectively work together, it experienced more difficulty. It discovered that four of the schools were giving master's degree work to relatively small numbers of students. But it also discovered each of these schools believed that the presence of graduate students stimulated faculty members and, therefore, contributed to the strengthening of undergraduate instruction. Subsequently, the commission asked the deans and directors of the forestry schools to meet as a subgroup and make recommendations back to the commission on ways in which those schools might effectively relate their work.

What the schools concluded was that they should avoid attempting to decide upon fields of effort in perpetuity. Instead they recommended to the commission that the schools and the board execute a memorandum of agreement which would provide a framework for joint planning and action in each of the schools. The memorandum of agreement would be signed by the presidents of the institutions and by the board and would, therefore, represent institutional policy rather than decisions made only within the forestry schools.

In itself the memorandum of agreement does not state agreements on specific ways in which the schools will work together. It reflects a process of planning rather than the conclusions of planning. It is a "statement of intent." It does provide, however, that the schools shall come together periodically and develop a regional plan which will become part of the agreement for a specified period. At the end of such period the schools will come together again for further planning and decisions in light of the situation at that time.

The commission accepted the recommendations of the schools and recommended that the presidents and the board adopt the agreement. After considerable discussion the presidents approved the agreement on October 21 and the board approved it on November 12, 1951.

So far as we are aware, this is the first such agreement in the United States. It is a departure from the board's earlier methods of regional collaboration since the agreement does not incorporate payments from states to institutions. Instead it looks forward to a continuing process of planning curricula and research in such ways that the contributions of each institution will be joined with the contributions of others. Whether the agreement has any real significance will depend on what future steps the schools are willing to undertake. The initial reaction of the presidents of the institutions was that the agreement was harmless, but had the possibility of being helpful. They recognized that in itself it did not change matters substantially—that will have to come later as the institutions meet to make plans for the next period.

The possible significance of such a document, however, is great. If the schools periodically come together to plan their programs, it could mean that the forestry schools could concentrate their efforts on those things which they are in the best position to accomplish and, therefore, could create a higher quality of instruction and research by making the small amounts of money available count for as much as possible. It could mean then that the forestry schools could assure their supporters—either legislatures or donors—that additional money provided would be spent in the most effective possible ways. The board will aid in obtaining additional funds from legislatures, industry, and foundations since the board has agreed, in signing the document, to assist upon request in obtaining additional funds. As the regional program in forestry proceeds, therefore, it has the possibility of helping to create a more effective system of forestry training and research which can more nearly meet the needs for competent care and use of our forests and can contribute greatly towards an expanding return from wood and wood products.

Herbicide Effects in Connecticut Vegetation, 1950

Frank E. Egler[1]
American Museum of Natural History, New York.

THIS IS the fifth and last report on herbicide studies being carried out at Aton Forest and vicinity in northwestern Connecticut. The five reports are "floristic" in point of view, that is, the data concern the effects of chemicals on particular species of plants. The first four papers[2] reported effects for 1946, 1947, 1948, and 1949 respectively, resulting from various techniques of selective spot-treatments of about 125 species (not including lawn and garden weeds), using various concentrations of several formulations related to 2,4-dichlorophenoxy acetic acid (hereafter called 2,4-D, or simply D). This fifth report presents the data for 1950, including the results to date of additional sprayings with 200 gallons of high-concentration solutions (3 percent acid equivalent or over, suitable for bark treatment), and 40 gallons of low-concentration solutions (0.3 percent, for foliage treatment). Only those species and sizes are mentioned in the present report which offer specific problems.

This report presents additional available data on basal-bark spraying, a technique of brush control which appears to offer manifold advantages for obtaining a one-spray root-kill.[3] This technique, which the author first recommended in the summer of 1949, apparently has been investigated by several workers, and reports are beginning to appear in the literature. Both Dow Chemical and American Chemical Paint companies are now suggesting the procedure for special purposes.

The project, of which this is the fifth preliminary report, was not designed as an intensive experiment-station study, dealing with a definite number of individual woody plants. Rather, it is extensive in nature, dealing with the development of methods that can be applied for mass conversions on large acreages. Four miles of forest trails, 5 acres of pine forest, 20 acres of seminatural grasslands and 20 acres of seminatural shrublands are now under herbicide control at Aton Forest. Five acres of pastures and brushlines on three nearby farms in the towns of Norfolk and Colebrook are under similar control. All areas are on sandy loam soils that are acid in reaction, in a region of beech-birch-maple-hemlock forests, with oak-hickory stands only on the summits of the hills. In all instances, the project is directed toward conversion to, and maintenance of, plant cover types that are suitable both for basic vegetation research and for practical values in trail maintenance and landscaping, as well as for pasture, forest, and wildlife management. Selective treatment with herbicides provides a tool of tremendous value for arresting or diverting the normal course of vegetation development, and for holding it at desired stages (Fig. 1). Research in progress indicates that the chief problem is the initial one of "conversion."

Work on this project was again made possible through a research grant from an anonymous New York corporation. Acknowledgment is also made to the American Chemical Paint Co., the Dow Chemical Co., and E. I. du Pont de Nemours & Co., which supplied the chemicals, and to D. B. Smith & Co. and Spraying Systems Co. for the equipment.

Methods and Data

Herbicidal techniques used in the 1950 season were as follows:

Herbaceous plants—Early spring foliage spraying, summer basal-stem spraying, and ground spraying.

Woody plants—Basal-bark spraying.

Certain herbicidal techniques have been at least temporarily abandoned:

Frilling and trunk wounding, involving exposure of the cambium and wood partly or entirely around the circumference, does result in lethal effects not yet otherwise obtainable. Nevertheless, basal treatment to unwounded bark is a less costly technique, and research is directed to this end.

Foliage-spraying of brush, though still a commercial practice on a large scale, was abandoned in July 1949, since at that time the root-kill obtained from any one year of basal-bark treatment was markedly superior to that from four years of foliage spraying on the *same* individuals of certain woody species. Published literature to date, when comparing the two techniques, emphasizes the greater root-kill from basal treatments; and I wait for evidence to the contrary before resuming foliage sprays. Such foliage sprays will definitely result in root-kill for certain species; but as a technique for large acreages of many species, they have the disadvantages of restrictions to certain seasons and heights, of using greater volumes of spray, with dangers from spray-drift onto adjacent properties, tendencies to kill above-ground parts before roots, and almost certain damage to desired low ground cover below the treated plants.

Stump treatments, although not investigated here, might become a standard practice where stumps are available. Comparative studies are urgently needed, however, between such treatments and basal

[1]Correspondence to the author should be addressed to Aton Forest, Norfolk, Conn.

[2]Egler, Frank E. Effects of 2,4-D on woody plants in Connecticut [1946]. Jour. Forestry 45:449-452. 1947.

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[3]This report was submitted for publication in April 1951.

applications to 2-year-old shoots. Field evidence, as well as theory, points to a higher percentage of root-kill, at no higher cost, for the basal-shoot treatments. This condition may be related to the added killing action of "chemical ringing," causing depletion of food reserves in the roots through utilization by the growing healthy aerial parts, and inability to replenish the supply by downward movement of carbohydrates through the bark. In other words, the practice of "kill first, then chop," rather than "chop first, then kill," may be economically preferable.

Mist spraying has been abandoned, because of inability to control drift even on apparently quiet days.

Water emulsions for bark applications have been given up in preference to oil solutions. All earlier reported research at Aton Forest was designed for water emulsions. Present evidence indicates that for the esters of 2,4-D and 2,4,5-trichlorophenoxyacetic acid (hereafter called 2,4,5-T, or simply T), the cheapest spray to obtain a given percentage of root-kill appears to be a relatively low concentration of the chemical in oil.

Formulations used during 1950, or used earlier and reported upon in this paper, include: American Chemical Paint Company's D acid in oil (LFN 571), D and T acids, ratio of 2:1 (LFN 572); D acid and pentachlorophenol (LFN 573); butoxy ethanol esters of D and T (hereafter called D-T), ratio of 2:1 (Weedone Brush Killer 32); and D acid, for water emulsion (ACP 638); Dow Chemical Company's isopropyl D (Esteron 44); isopropyl T (Esteron 245); isopropyl D-T, ratio of 1:1 (Esteron Brush Killer); propylene glycol butyl ether (hereafter called p-g-b-e) T (New Esteron 245); and p-g-b-e D-T, ratio of 1:1 (New Esteron Brush Killer); and du Pont's isopropyl and p-g-b-e D (Hi-ester 2,4-D Weed Killer); isopropyl and amyl T (2,4,5-T 43 percent Ester Brush Killer); triethylamine T (2,4,5-T 57 percent Amine Brush Killer); and diethyl-

FIG. 1.—Fields at Aton Forest, last plowed and planted prior to 1926. *Top:* Forest at right and in background was field in 1926. Present field area was mowed annually through 1945, at which time almost 100 percent of surface was brush covered; since then it has been converted to grassland by use of herbicides. The forest edge is now being thinned with herbicides for wildlife values. *Center:* Similar to top photo in treatment; control plot of *Asclepias syriaca* at left; part of mile-long mowed transect in center. *Bottom:* This area was mowed annually through 1940, then abandoned. Photo shows appearance two years after conversion from brush land to grassland with herbicides.

amine D and triethylamine T, ratio of 1:1 (2,4-D and 2,4,5-T Amine Brush Killer). D-T mixtures were used in the ratios of 2:1, 3:2 and 1:1, but within the limits of the field researches here, no differences are yet apparent. These materials were used both with oil and water as carriers, and with oil-water mixtures in several proportions. Since the effectiveness of these sprays for basal bark treatment seems to vary directly as the proportion of oil, only the results from all-oil carriers are mentioned below, unless otherwise specified. With the field techniques applied, no differences are yet apparent between the results from the "low esters" (isopropyl and amyl esters) and those from the less volatile "high esters" (butoxy ethanol and propylene glycol butyl ether esters). More precise experiments of other investigators have shown a slight advantage for the high esters.

Methods of expressing the concentrations of the chemicals in herbicidal sprays have unfortunately not become standardized. There is general agreement that they should be expressed in terms of the acid equivalent (hereafter called a.e.), rather than the particular formulation used, be it salt, ester, or amine. For the acid equivalent, concentrations are given as either: (a) volume or weight ratios, in percentages or p.p.m. (although the chemical corporations seem resistant to releasing volume percentages of the commercial products), or (b) weights per unit volume in non-metric units (as lbs. per 100 gallons of spray). This non-metric system is possibly suited for some large-scale agricultural projects, but it is already in conflict with the Canadian work which involves the Imperial gallon. Furthermore, it adds an entirely unnecessary complication to the researcher, either professional or amateur, who can most conveniently handle volumes, not weights, and who would encounter additional needless problems when dealing with the weights of oil-water carriers in various ratios. All percentages given in this and the preceding four reports are a.e. percentages, using that given on the commercial label as if it were a volume percentage (instead of the weight percentage it is); the inaccuracy of which is not significantly great.

All spraying was done with a 5-gallon knapsack sprayer, using nozzles varying in pattern and capacity. The variation in vegetation itself, both in size of shoot and in aggregation of shoots from a single crown, makes any one nozzle unsuited for all purposes. A desirable nozzle for general use would appear to be a wide-angle flat-spray low-capacity unit, equipped with a check valve, which by suitable manipulation can be made to cover broad surfaces, or slender stems, singly or in groups. The check valve is essential to prevent loss by dripping between plants, although the valve is apparently sensitive to low pressures, taking several minutes to begin functioning, and ceasing shortly before the tank is empty. In all cases plants were wetted until the solution began to roll down the bark, or off the foliage. It is admitted that this method may permit wide variations in the quantity of spray (and thus, of pure chemical) applied per plant. On the other hand, the experience of the author indicates that this is the most suitable technique for operations on varied types of brush when large acreages are to be treated.

The idea of "kill" has been much abused in the technical literature, and it might be best to avoid the word entirely. Three concepts are confused:

(1) *Leaf-kill*, the photogenic subject of excusable enthusiasm several years ago, is now to be recognized as merely a leaf-burn with, if any, a negative correlation with root-kill, since death of the leaves appears to trap the chemical the effects of which would otherwise pass downward toward the roots.

(2) *Shoot-kill*, or kill-to-the-ground, may be only chemical mowing, and in itself is considered a desirable result of brush spraying by many investigators. Field evidence at Norfolk, and in other areas, implies that too rapid a shoot-kill (as with very sensitive species, or when spraying the entire above-ground portions rather than only the bases) may, like leaf-burn, trap the chemical that would otherwise kill the roots. This appears to be the case with staghorn sumac and trembling aspen.

(3) *Root-kill* should be the sole aim. Recognition of root-kill has its own problems, however, and is too often reported on insufficient evidence, sometimes on nothing more than a shoot-kill. Exhumation, costly of time, is necessarily a limited sampling technique. Many woody plants rise and grow again, even after appearing "dead" for most of a growing season. Furthermore, some treated plants, after kill to the ground, send up one or a few feeble shoots which succumb, probably by secondary fungal infections, during the second year. In one instance, a basal-wound treated fire cherry (*Prunus pennsylvanica*[1]) succumbed without any root-suckering, during the third summer, apparently from secondary decay (see Egler 1949: 2506). It would appear therefor that the percentage of root-kill resulting from any one spray treatment cannot be judged until at least two full years have passed, and that any second spray treatment one year later may be unnecessary expense. In many instances, however, a "failure" can be correctly diagnosed at the end of the first year by the degree and type of kill.

Undesired damaged or kill has been extremely limited at Norfolk. It is caused mainly by: accidental spraying, drift, and volatility. Accidental spraying, as well as drift, is of course, largely eliminated by knapsack basal spraying, where a high degree of selection is possible, with the nozzle kept close to the ground, and with spraying possible in the dormant season. The volatility of the high esters is apparently significant, for complete leaf-burn of early spring foliage of roses and

[1]The Latin nomenclature is that of *Gray's Manual*, 8th edition. When differing other than orthographically, seventh edition names follow.

Boston ivy, and various types of minor damage, have been laid to ground-spraying 20 feet away, with 6 percent solutions, under circumstances that do not point to either spray-drift or root absorption.

Herbaceous Plants

Early-spring foliage-spraying.—For root-killing a large variety of herbaceous plants in seminatural grassland, a 0.3 percent solution of D-T esters in water appears to be suitable, spraying only to wet the foliage completely. A 0.25 percent solution is not too weak; a 0.5 percent solution may burn some foliage too quickly. Resistance to the chemical increases rapidly with size of the plant, especially the goldenrods and asters, for which a summer foliage spray causes only temporary stunting or partial kill-back. The season for early spring spraying is very short—at the most, for three weeks of May in northwestern Connecticut. Providing the plants are recognizable by the operator before that time, as by winter rosettes, it appears that most of the species can be root-killed by spraying the spots—soil and plant—with a 3-5 percent solution or one by lower concentration. Such plants fail to develop, possibly through absorption of the chemical by the roots in the soil.

Such early-spring foliage-spraying is not effective on all ferns, spreading dogbane (*Apocynum androsaemifolium*), milkweed (*Asclepias syriaca*), steironema (*Lysimachia ciliata, Steironema ciliatum*), oakesia, and live-forever (*Sedum purpureum*), as well as lycopodiums (*Lycopodium* spp.) and wintergreen (*Gaultheria procumbens*).

Summer basal-stem spraying.—In the 20 acres of seminatural grassland derived from brush-covered old fields, now in their fifth year of chemical treatment, goldenrods (*Solidago rugosa* and *S. graminifolia*) continued to be the commonest of the unwanted plants. Their persistent abundance is apparently related not only to their originally large numbers, but to their spread following release from competition with the woody brush, plus their resistance to foliage sprays in summer, and the ease with which they are missed in the early-spring sprayings. To counteract this situation, basal stem spraying with 4-6 percent D-T oil solutions was practiced, when the plants were tall enough to be conspicuous in the grass, beginning June 4 and extending through July. No plants were saved for August spraying.

Technique of application can be quick and rapid if a check valve is used in the spray nozzle, a momentary compression of the hand being sufficient to get a suitable quantity on a stem. Plants yellowed slowly, especially as the season advanced, and shoots were completely dead 5 to 6 weeks later. By autumn no new shoots had appeared in the vicinity of each such shoot. Although it is still too early to judge the success of this technique, it holds unusual promise.

Dogbane and milkweed are two other tall species which four years of foliage treatment have failed to eliminate. Foliage burns for these species apparently have no effect on the root systems, except possibly to stimulate the development of new shoots. A colony of milkweed first basal-sprayed in 1948 was not yet eliminated at the beginning of the 1950 season, though the number of shoots (all very small as compared to the control) was reduced to 5 percent of the original. Such treatment, also using 4 to 6 percent D-T oil solutions, caused an extremely slow withering and drying of the tops. A one-treatment root-kill is not known.

The ferns, bracken (*Pteridium aquilinum, Pteris aquilina*) and hay-scented, can be basally sprayed. Mid-summer treatments resulted in no noticeable withering of the tops before autumn, and it is doubtful if any root-kill was effected.

Ground-spraying.—Repeated foliage-sprayings of colonies of steironema and oakesia, through four years and sometimes involving several sprayings a year, have not resulted in any effective root-kill. Exploratory tests were made this spring, consisting of a thorough wetting of the ground surface with a 6 percent D-T emulsion in water. The resultant complete foliage-burning of grasses and forbs was followed by a regrowth of grass (*Agrostis* and *Anthoxanthum*), by midsummer but not of the forbs. Such data indicate that it might be possible to produce a temporary concentration of herbicide in the soil such as would root-kill these resistant forbs, but not grasses. The study is being continued.

Onoclea sensibilis is a fern which although easily leaf-burned, is highly resistant to root-kill. Weakened colonies were treated to a similar ground-spray in early summer, and had not regrown by autumn.

Live-forever (*Sedum purpureum*) is another species which has resisted four years of repeated foliage sprayings, even though it has been killed to the ground time and again. Several hundred clumps of this plant occur in an area of about 1 acre, individual clumps often averaging less than 1 meter apart, and the entire colony centering about what is probably an old house site. Since this plant does not seem to spread by underground runners, it is assumed to have propagated through division, during successive early agricultural operations. No actual increase has been noted in recent years. In early spring these clumps were also treated with a 6 percent D-T emulsion in water. No regrowth was noted during the season, but root-kill is not yet assured.

Although no special attempt has been made to remove colonies of lycopodiums and wintergreen from the seminatural grasslands, these plants, resistant to all foliage sprays, have apparently not survived 4-6 percent D-T emulsions in water, where small patches have been sprayed while treating shrubs and trees.

Woody Plants

Most of the field tests during 1950 were concerned with bark treatments. Conclusions will not be obtainable until another year

has passed—for those cases where kill to the ground has already occurred. The high success being obtained with root-kill of thin-barked shoots of almost all species up to five years of age is offset by the failures with some larger materials, aside from thin-barked, sensitive trembling aspens (*Populus tremuloides*), birches, and cherries. In general, it would appear that the resistance of a species to root-kill may increase as does the square of its diameter. A correlation may also be seen with the height of the tree, the apparent volume of the crown, the assumed extent of the root system, the thickness of the bark, and the amount of phellem and phelloderm in the bark. Which of these factors is most significant has not yet been determined, but all should be noted at the time of treatment and in the designing of future research.

Evidence indicates that many of the failures were related to too weak a concentration; too little quantity of spray per plant (as is likely when a small squirt gun is used, rather than a knapsack sprayer); and application too far from the ground. To choose a few examples: Young white pines (*Pinus strobus*) treated July 12, 1948 (see Egler 1949:250b), at a height of 1 meter from the ground, have not died much below 30 centimeters from the place of application, and all now seem destined to survive. A 4-gallon treatment of 1 and 2 percent D acid on December 20, 1949, on 3-meter red maple (*Acer rubrum*), gray birch (*Betula populifolia*), aspen, and tall blueberry (*Vaccinium corymbosum*), has to date resulted in a kill to the ground of less than 10 percent of the shoots. A 3-gallon treatment of both 2.9 and 3.6 percent D-T acids, and 3.6 percent D acid with pentachlorophenol, on a wide variety of woody plants varying in size from 2-meter shoots to trees 20 centimeters in diameter, during January and March 1950, gave results that progressed regularly during the summer, in direct correlation with the sizes of the trees. The smallest trees were the first to succumb; slender trees up to 5 meters in height were brown by mid-summer; larger trees seemed unaffected. By January 1951, it appeared that everything 5 centimeters in diameter had not died to the ground. In this instance, application was with a squirt gun, such as used for spraying automobile springs, and the quantity per plant was less than with knapsack spraying, as well as being applied higher above the ground. The larger trees might not succumb even with these implied improvements in treatment. A 4-gallon treatment of 6 percent D-T (2:1 ratio) in water, applied May 2, 1950, to a variety of older plants above 2 meters in height (except for meadowsweet, (*Spiraea latifolia*), including red and sugar maples (*Acer saccharum*), blueberry, winterberry (*Ilex verticillata*), black cherry (*Prunus serotina*), choke cherry (*Prunus virginiana*), and alder (*Alnus rugosa, A. incana*), shows to date no kill-to-the-ground, except for the spiraea. The failures in this instance may be related to the water carrier, to the thicknesses of the barks, and to the need for a greater quantity of spray per individual. More serious failures are concerned with medium-sized trees of various species. Several thick-barked apples (*Pyrus malus*), and pines 15 centimeters in diameter, squirt-gun-banded at a height of less than 1 meter with 30 percent D-T on December 8, 1948, have shown no effects whatever. Several red maples of the same size, similarly treated, have developed swollen cracked bark, but now seem to be in process of recovery. Three dozen red oaks (*Quercus rubra* var. *borealis*), shagbark hickories (*Carya ovata*) and hop hornbeans (*Ostrya virginiana*), similarly treated November 2, 1948, and over 10 centimeters in diameter, show no ill effects. About ten choke cherries 3 meters tall and 5 centimeters in diameter, treated with 20 percent D-T in December 1948, became swollen and cracked; but during the growing season of 1950, seemed to be recovering. In short larger trees generally have not yet been killed by basal-bark treatment, and those which have been killed have thin bark, and have been sprayed with ample quantities of high-concentration solutions close to the ground. The quantity of spray may be the most critical factor for thick-barked trees.

Successful root-kill from basal-bark applications—in complete contrast to the failures mentioned above—has been almost universally obtained with all woody brush under 2 meters in height, regardless of species, and with taller material for plants already known to be sensitive and where the bark is thin. Not a single woody species mentioned in this series of papers stands out for its resistance to this type of treatment. For the consideration of complete root-kill of these bark-permeable plants, it is well to segregate those species which spread by underground root systems, or regenerate by root-suckers, from those which do not send up adventitious shoots from various parts of the roots.

Among the suckering plants are trembling aspen beech (*Fagus grandifolia*), staghorn sumac (*Rhus typhina*), fire cherry, black locust (*Robinia pseudo-acacia*), blackberries (*Rubus* spp.) and raspberries (*Rubus* spp.), which, by virtue of this characteristic, offer special problems in herbicidal root-killing. The chemicals, thought to travel downward through the roots relatively slowly, often seem to kill only a small portion of the roots nearest the main trunk. The remaining roots then appear to be stimulated to produce shoots. The end result: more small shoots scattered over a larger area than originally. Numerous observations at Norfolk seem to indicate that once such root systems are stimulated to produce small shoots, the control problem is at least quadrupled. Furthermore, such young shoots are invariably killed back to the ground very quickly offering additional stimulation to further suckering. The remedy appears to lie in a very slow killing of larger trees, allowing the unsprayed healthy growing tops to exhaust those roots that are beyond the reach of the chemical, or at least

not stimulating them to produce suckers. Whatever the physiology interpretation be, two dozen large aspens and several fire cherries in various localities were basal-treated in the winter of 1948-49 (see Egler 1950: 82 b; 83, fig. 4). They died in the summer of 1949, and have failed to send up a single sucker from any part of the root system. Where such suckering is not prevented, the only solution is to spray each shoot when it reaches a suitably large size. Each such spraying kills an additional part of the original root system, and the procedure eventually destroys the colony. In this way, colonies of all the plants mentioned above have been totally eradicated.

In contrast, the non-suckering plants theoretically offer a much simpler problem: the only places from which they may sucker are along the trunks and from the very bases of the trunks. Low spraying automatically eliminates the potential suckering area of the trunk above the point of application. Ground-line spraying, with slight spread of the chemical, kills the suckering area at the base of the trunk. It is possible that no actual poisoning need take place through the rest of the root system, for these organs, deprived of nourishment from the crown of the tree and unable to send out suckers, would die in isolation. The root-killing obtained in oak, ash (*Fraxinus americana*), maples, birches, alder, willows (*Salix* spp.), certain cherries and numerous shrubs bears out this hypothesis. Several such areas as that described previously (Egler 1950: 84a) from a treatment of December 2, 1948, have failed to send up a single shoot by the end of the 1950 growing season. Among 252 small red maple stumps (Egler 1950:81a) also treated in December 1948, not a single one has been seen to resprout. A modification of this reaction occurs with larger trees (to 8 centimeters in diameter and 7 meters in height), which send up one or two very feeble shoots the following season, to be followed by complete root-kill and death the following year. It is not impossible in these cases that ground-line spraying was imperfect, and that the shoots arose from an undamaged part of the root collar. The following woody plants deserve special comment:

Apple.—One of the herbicide-induced grasslands contains approximately 200 young apple trees, less than 1 meter in height, that have resisted all four years of foliage spraying. In June of 1950, most of these were basal-sprayed with 6 percent D-T in water. By the end of the 1950 season, kill-to-the-ground still appeared doubtful.

Hawthorn (*Crataegus macrosperma* type).—This resistant group, unfortunately too rare locally to obtain indicative results, is apparently not root-killed by a 6 percent D-T in water, although it may be killed-to-the-ground.

Juniper (*Juniperus communis*).—This common pasture pest has long been known to be completely resistant to foliage sprays. Several hundred small individuals (to 0.5 meters in breadth) both in grassland and in newly seeded pasture, have been easily killed by a variety of sprays, including 6 percent D-T in water, and 5 percent D-T in half-oil, if the entire plant is sprayed. Special tests on this shrub indicate that rootward movement of the effects of the chemical are almost negligible, even two years later. Movement outward to the ends of the branches is almost negligible. In those cases where entire branches have died following basal application, the death is inferred to be due to total killing of the cambium at the point of application.

Mountain laurel (*Kalmia latifolia*).—Solutions of 5 percent D-T in water have successfully killed branches of this otherwise resistant shrub. Movement rootward of the chemical effects appears to be negligible.

Norway spruce (*Picea abies*).—A 5-meter tree was basal-sprayed August 14, 1950, with a 5 percent D-T half-oil solution. Within a month, the entire upper meter of the tree, and several ends of lower branches, were yellowed and shortly after the needles fell. By late fall however, new and apparently healthy buds had formed on all branches. This herbicidal effect, the best so far obtained with this species, might be perfected with an all-oil and stronger solution, applied in greater quantity.

Conclusions and Recommendations

On the basis of results now obtained with approximately 125 species at Norfolk, a large number of herbaceous plants can be killed in their winter rosette stage by ground-spraying with 3 to 5 percent solutions of esters of 2,4-D and 2,4,5-T in water. During May, and until the plants are 15 centimeters in height, the most of the species can be root-killed by foliage applications of 0.3 percent in water. In midsummer, tall goldenrods, asters, and similar plants are treated with basal sprays of 4 to 6 percent, in oil or water, with reasonable chance of root-kill. Milkweed and dogbane are suited to such basal treatment, but the colonies require several sprayings. All grassland ferns are highly resistant, and require repeated "chemical mowings," although ground-spraying with strong solutions is promising. Steironema, oakesia, and live-forever also appear to respond to ground spraying.

Basal-bark spraying of woody plants under 2 meters in height appears to result in greater root-kill than does foliage spraying. Larger thick-barked trees are highly resistant, and at present require frilling and trunk-wounding or unusually high volumes of spray. Treatment can be in any month of the year, and no one season appears preferable. Solutions of 4 to 6 percent mixtures of 2,4-D and 2,4,5-T esters have been used successfully. The quantity of spray per plant can be varied for those known to be highly sensitive or resistant. Oil carriers are superior to water; and ground-line treatment superior to higher applications. In general, upper portions of the shoot system not only need not be sprayed, but conscious effort should be made not to spray them. A healthy unsprayed upper portion continues to grow, probably tending to exhaust the root system of nourish-

ment which cannot be replaced by movement of food down through the damaged bark. This slow-dying condition appears to be important in root-killing of suckering species, such as aspen and sumac, where a rapid killing of the upper portions appears to stimulate the development of suckers at some distance from the main trunk. Small feeble shoots that sometimes appear after kill-to-the-ground and during the first year after treatment, may die during the second year, and consequently the final effect of a basal-bark treatment cannot be judged until at least the end of the second year after application.

Geographic Differences in Cone-Opening in Sand Pine

Elbert L. Little, Jr., and Keith W. Dorman

U. S. Forest Service, Washington, D. C. and Asheville, N. C., respectively.

SAND PINE, *Pinus clausa* (Chapm.) Vasey, a small pine of sandy soils native in Florida, is characterized by retaining most cones closed and unopened on the trees for a few years or until opened by the heat of a forest fire. The scientific name *clausa*, meaning closed, refers to this feature. However, a race in western Florida differs in having the cones opening normally at maturity.

The botanical characteristics and distribution of this species were summarized some years ago by Sudworth (*6*) and by Sargent, (*4*) who reported that it was first noticed in 1846 near Apalachicola by A. W. Chapman. Sand pine forms low, closed forests of a single species of narrow, pointed trees 20 to 50 feet tall on relatively poor sandy plains, especially on whitish dunes near the coasts. Taller trees occur farther inland. The species is abundant locally in a narrow strip along the east coast from St. Augustine southward to Fort Lauderdale. The most extensive forest of sand pine is a solid block of about 210,000 acres within the Ocala National Forest in Marion and Lake counties, north-central Florida. On the Gulf Coast sand pine occurs south to Naples in Collier County and is well displayed in another area in western Florida between Panama City and Pensacola. West of Pensacola it extends a few miles into the southern part of one county in a second state, Baldwin County, Alabama.

In recent years this formerly unused small tree, commonly not of saw-timber size, has become commercially important as a source of accessible and cheaply harvested pulpwood. Regeneration by silvicultural means has been very difficult in parts of the range where the cones remain closed on the tree (*1*). Use of a race which does not have this characteristic might provide a partial solution.

Floyd M. Cossitt, in charge of planting for the Southern Region of the U. S. Forest Service, has called to our attention the sand pines in western Florida which he observed several years ago to be characterized by open cones. Attempts to collect seeds from these pines in January were unsuccessful because the cones had already opened and released the seeds.

In January 1951 we made field studies and collections of sand pines between Pensacola and Panama City in western Florida, on the Ocala National Forest in the north-central part of the state, and also along the east coast. In western Florida the low-spreading sand pines are of uneven ages and mixed with smaller numbers of scrubby oaks, such as live oak, *Quercus virginiana* var. *geminata* (Small) Sarg., turkey oak, *Q. laevis* Walt., and myrtle oak, *Q. myrtifolia* Willd. Instead of dense even-aged stands as in most of the range in eastern Florida, the trees were less crowded, with good reproduction of scattered younger trees in the openings. Most cones of the preceding year were partly open and the scales were sufficiently separated for the seeds to fall. However, a few cones were still closed.

As others have observed, the charactistic of closed cones is not constant. Sargent (*4*) noted that some cones open at maturity, some remain closed three or four years, and others become enveloped by the growing trunk or branches unless opened by fire which kills the trees and releases the seeds. (Sand pine often forms two or three whorls of cones a year.)

Closed or serotinous (late opening) cones occur in several other species of pines, such as lodgepole pine (*Pinus contorta* Dougl.) and jack pine (*Pinus banksiana* Lamb.), in which the forests are also regenerated from cones opening after fire. Shaw (*5*) interpreted the serotinous cone as a specialized character in progressive evolution within the genus.

Cones of sand pine were examined to verify the explanation of delayed opening. Shaw stated that in most species of pines the hygroscopic energy of the scales is sufficient to open the cone as it dries upon maturity but that in several species the adhesion is so persistent that some cones remain closed many years. He illustrated the area of adhesion by a simple experiment with a cone of *Pinus attenuata* Lemmon, which we have repeated with sand pine. When a cross section 1 to 1.5 centimeters thick is sawed from the middle part of a cone of sand pine, a central core is easily pushed out with the fingers, leaving an outer ring about 2 to 5 millimeters thick, thinner toward the apical end. Further examination of cut cones and scales shows that scales are separated most of their length by the pair of large-winged seeds developed at the base. Adhesion of

adjacent, overlapping cone scales is confined to a narrow border beyond the ends of the winged seeds, a dark brown band 2 millimeters or less in width just inside the exposed surface (apophysis) of each. When the ring composed of adhering outer ends of cone scales is immersed in boiling water, the scales start to come apart within a few seconds and usually are completely separated within 1 or 2 minutes.

Roe and LeBarron (*3*) reported that in jack pine the cone scales are strongly bound together by a resinous substance which must be softened and that the scales open after cones are dipped in boiling water 10 seconds. Closed cones of sand pine immersed in boiling water ½ to 1 minute or longer separate their scales slightly within a few minutes, and afterwards, upon drying, open their scales wider so that seeds can be released.

We find no morphological differences between trees and specimens of sand pine from these two geographic areas in Florida which could be used to separate them botanically. However, common names to distinguish these races will be useful. We propose to call the typical sand pine with closed cones *Ocala sand pine* or *Ocala race*, after the Ocala National Forest in Florida, where the race makes up the major forest cover. For the sand pine of western Florida with open cones we suggest the name *Choctawhatchee sand pine or Choctawhatchee race* (meaning Choctaw River), in memory of the former national forest of that name, now the Eglin Field Military Reservation, where the race occurs.

Whether the Ocala and Choctawhatchee races differ genetically has not yet been demonstrated. Experimental plantations of the two races are being made on the same area of the Ocala National Forest. If the open-cone characteristic remains constant and if the Choctawhatchee race is desirable in other respects, then it would be preferred for planting on areas where artificial reforestation may be necessary.

Harper (*2*), in reviewing the frequency of fire in different forest types under natural conditions, has suggested that the normal frequency of fire in stands of sand pine was about once in the lifetime of a tree. He stated that fire could not travel over the white sand too poor to support any grass but that about once in the lifetime, perhaps in very windy weather, fire sweeps through the treetops, releasing the seeds while killing the trees. Possibly the open-cone race of sand pine in western Florida with its open forests of uneven-aged trees and more undergrowth has been subjected to surface fires more often. If so, possibly the closed-cone race has developed partly in response to conditions favoring less frequent but more destructive fires.

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Forestry: An Honored Profession

The major criticism offered of forestry education is that foresters need more basic science, more research, and also more broad generalized knowledge and acquaintance with the local ecological, social, and economic environment in which forest policies must be made. This lack of breadth is the same criticism which is now being made in most other fields of professional education. The feeling of a noted leader in forestry education that the forestry schools do not measure up at this point is therefore not to be wondered at. No professional groups have succeeded in solving this problem of breadth and balance, though many valiant efforts are now under experiment. However, the first step toward the improvement desired is the recognition that the problem exists.

Because of the forestry educational system established, because of inspired leadership, because of the career system maintained in federal and some state forestry departments, because of the group solidarity and good public relations maintained by foresters, forestry has become a distinct and honored profession in this country.

From *American Forest Policy by*
LUTHER H. GULICK, 1951.

Yield Tables for Big Game Herds

George Hills Kelker

Utah State Agricultural College, Logan.

THE TERM "YIELD TABLE," as used in forestry, indicates the quantity of timber removed at one time from a known area when certain variables are known, such as age classes, number of trees per acre, height and diameter groups, extent of diseased trunks, and the site class. In the case of measuring the quantity of big game removed, the variables that need to be considered are the average number of fawn births per adult doe, the sex ratio of the adult animals after hunting season, the extent of killing adult females and fawns, and the number of animals per herd. Removal data from any administered herd in the country may be determined from tables such as herein described and presented.

The yield table is but another tool to analyze the degree of removal from the herd. Its advantage is that it may be used before the hunting season to test the results if does and fawns are expected to be shot. This appraisal of future events is important in areas where the sportsmen and ranch owners are in disagreement. For example, a deer herd of 6,000 head, based on a February count, had had 640 bucks removed the year before, leaving a sex ratio of one buck to four does after hunting season. There was one fawn per adult doe (excluding yearlings) present at the time of the hunt. Field studies during the summer after the hunt show a fawn-doe ratio as good or better than the year before. The livestock people recommend a kill of 1,000 does, but the sportsmen say 100 is enough, and that a kill of 1,000 does will wipe out the herd. It is a laborious process of arithmetic to test the effect on the herd of removing 1,000 does; and it takes equally as long to compute the reduction for a removal of only 100 does.

The use of the table eliminates such calculations. However, the forecasted fall population of this second season must be known so that the buck removal may be approximated. A herd of 6,000 deer, winter count, with a 1:4 sex ratio, and having a fertility rate of one fawn per adult doe the next summer will gain 2,400 fawns. Thus, the fall population will be 8,400 head. The proportion of the bucks removed the year before, when there occurred a negligible kill of does and fawns illegally, is 9.7 percent of the summer herd, according to the yield table. Thus, a buck hunt this coming fall of the same intensity as last fall, will likewise remove 9.7 percent or 815 adult males. Thus a removal of 1,000 does will be in excess of the number of bucks shot, and at least 500 fawns also being removed will give an expected kill of 2,315 head, slightly less than the estimated fawn crop. Certainly the herd is not reduced; and if any reduction is obtained it is by shooting more than the 500 fawns. Such action is problematical.

Suppose the group compromises on a reduction of 1,000 antlerless deer, which I have seen happen several times. The reduction to the herd is 1,800 animals out of 8,400 or a 21.5 percent removal. Thus the use of the yield table gives a quick appraisal of the removal in terms of bucks for the coming hunt (first column—zero percent does killed), and from that the estimated number of does and fawns may be determined. However, the group must be in agreement as to policy, whether the estimated 8,400 head is at the carrying capacity of the range (winter or summer, whichever is lesser) or whether it is over or under the carrying capacity and to what extent it is.

Such agreement is difficult to obtain and the agreements over removal stem from such divergent viewpoints.

The variables that must be con-

TABLE 1.—YIELD TABLE FOR INDICATING THE FRACTION OF THE SUMMER DEER HERD WHICH IS REMOVED TO GIVE THE STATED SEX RATIO AFTER HUNTING SEASON WHEN BOTH THE AVERAGE FAWN BIRTH PER ADULT DOE AND THE DEGREE OF KILLING OF DOES ARE KNOWN

Average fawn births per adult doe	Number of does per buck after hunting season	When the kill of does is as large as the kill of bucks the total removal is: 0%	20%	40%	60%	80%	100%
		Percent					
½	2	4.31	5.97	8.07	10.8	14.8	19.0
	3	6.14	8.22	10.6	13.6	17.3	21.7
	4	7.15	9.60	12.2	15.0	18.0	22.7
	5	7.84	10.2	12.7	15.9	19.2	23.0
	6	8.30	10.4	12.9	16.2	19.7	23.3
	7+	8.60	10.5	13.0	16.4	20.0	23.5
1	2	5.60	8.07	11.0	15.3	21.0	28.2
	3	7.97	11.1	14.6	18.8	24.3	31.0
	4	9.20	12.5	16.3	20.6	25.8	32.0
	5	10.0	13.5	17.3	21.6	26.6	32.4
	6	10.5	14.0	17.7	22.0	27.0	32.6
	7+	10.8	14.2	18.0	22.3	27.3	32.8
1½	2	6.25	9.29	12.8	17.7	24.8	34.2
	3	8.70	12.3	16.5	21.8	28.4	36.0
	4	10.0	13.9	18.4	23.6	30.1	38.0
	5	10.8	14.9	19.4	24.8	31.0	38.4
	6	11.1	15.3	20.0	25.4	31.5	38.5
	7+	11.3	15.6	20.5	25.8	31.8	38.6
2	2	6.52	9.70	14.2	19.4	27.1	37.7
	3	9.02	13.0	17.6	23.5	30.7	40.6
	4	10.3	14.8	19.5	25.4	32.6	41.0
	5	11.1	15.8	20.7	26.6	33.6	41.6
	6	11.5	16.2	21.5	27.5	34.4	42.4
	7+	11.8	16.5	22.0	28.0	35.0	43.6

sidered in establishing a yield table are these:

a.—The sex ratio to be obtained by hunting,
b.—The fertility rate,
c.—The number of does killed, in terms of 100 bucks killed,
d.—The number of fawns killed in terms of 100 does killed, and
e.—That no other losses occur to the herd.

In the yield table presented, there are six conditions of sex ratio, four conditions of fawn births per adult doe, six conditions of degree of doe killing, and one condition on fawn removal. In all, there are 144 combinations presented in Table 1. Any intermediate degree of the first three conditions can be interpolated from the values given in the table. Thus an infinite number of combinations are obtainable.

This table was founded on the assumption that the fawn-kill is one-half of the proportion of fawns to does. This assumption arose out of a fact and an ideal. On the Cache National Forest during the first two years of the hunting of antlerless deer, the hunters shot about one-half as many fawns as does because they wanted to save the fawns. Not only is this an admirable concept, but also it is a sporting trait that is worthy of inculcating into all game clubs just on the basis of sportsmanship alone. If the hunter of antlerless deer will pass up the first fawn seen, and shoot the next antlerless—doe or fawn, he will be a sportsman as well as a practical husbandman in saving a young animal for the herd increment.

To return to the uses of the table. Besides forecasting probable numbers for removal under a particular pattern, the table indicates the fraction that is removed from the summer herd. Examination of the table shows that the lower sex ratios suffer a removal of about one-half as much as the higher sex ratios suffer, when other variables are identical for both cases. Naturally, the greater the fertility, the greater is the percent of removal to achieve the same sex ratio that exists after hunting season. Thus herds with high fertility stand heavier hunts than those herds with low fertility in order to obtain the same sex ratio after hunting season.

The third noticeable feature of the table is the increased percent for any combination of sex ratio and fawn-births when does are also killed. The increase is as much as five times greater when the does are shot in equal proportion to bucks, and fawns are shot in one-half of their ratio to does. When does are shot in equal numbers to bucks and a given sex ratio is obtained for a few years, the herd is then stabilized. Under such removal the herd decreases only if in addition it suffers significant losses from predation, diseases, or malnutrition. Managed herds rarely have such losses.

The table shows that the summer herd must be reduced at least one-fourth, if not one-third, in order to remove the increase. Since buck kill can be approximated on the conservative side, the remaining numbers to make up the 33 percent removal must come from the antlerless portion of the herd. Thus the authorized removal of such animals must be at least one-and-one-half times as large as the buck kill, and twice as large in case the hunter success ratio is less than 50 percent. Sportsmen fail to see that the buck kill is the least of the three groups, even to stabilize a herd. A herd reduction, then, must remove three to five times as many antlerless deer as antlered ones.

The table may be used in census work: divide total hunting loss by the proper percentage figure in Table 1 to give gross population before hunting season.

The table is based on the assumption that total losses are due solely to hunting, but such circumstances are exceedingly rare. Since losses caused by predators, accidents, disease, malnutrition, and winter killing do occur, any one value in the table represents the sum of all losses, hunting and environmental. Hence one goal in management of big game is to evaluate properly the various drains on the deer herd in order that the fraction of the removal lost to the hunters may be reduced, and that they get a larger proportion of this total.

The occurrence of winter losses destroys the validity of these tables because fawns die in far greater proportion of their numbers than do other members of the herd. Furthermore, a herd suffering winter losses is not a managed herd, and these tables are for managed herds. This table applies to other animals besides deer—antelope, big horn sheep, caribou, moose, and probably elk. Since all these animals have the same reproductive habits, their hunting losses may be appraised by the table.

Full management of big game herds will be hastened when statistics on herd composition and gains and losses can be evaluated in terms of an increasing or decreasing effect upon the herd.

Journal of Range Management to Publish Meeting Papers

Three papers given at the meeting of the Division of Range Management, Society of American Foresters, at the 51st annual meeting of the Society in Biloxi, Miss. on December 14, 1951, will appear in the *Journal of Range Management* as follows:

"Better Management on Longleaf Pine Forest Ranges," by Robert E. Williams, May 1952 issue.

"Management and Administration of Range Lands in Japan," by Walt L. Dutton, July 1952 issue.

"Managing Beef Cattle on East Texas Timberland," by Richard M. Townsend, September 1952 issue.

Weed Control With Methyl Bromide

J. C. Kopitke and Jesse K. R. Langford

Nursery manager and agricultural aide, respectively, Soil Conservation Service, Elsberry, Mo.

WEED CONTROL has always been a costly and troublesome problem for most nurseries. While the use of mineral spirits brought a great advance in weed control, it is not a cure-all nor is it applicable to all types of nursery production.

A method of weed control for both deciduous and conifer stock has long been sought. It is available now through use of methyl bromide as a combination soil sterilizer, fumigant and weed killer.

Exploratory trials at the Soil Conservation Service Nursery at Elsberry, Mo., were conducted in 1949 and 1950. The soil types treated were all fairly permeable to permeable silt loams (Genesee silt loam, Memphis silt loam, and Lintonia silt loam). These trials gave excellent results. The treated plots were not only weed-free but also produced more usable plants of better quality and vigor per square foot.

Results of Exploratory Trials

The initial work with methyl bromide was undertaken with considerable skepticism. For a weed-killing operation that would probably need to be repeated with the planting of each new nursery crop, the per-acre cost of methyl bromide along with the necessary equipment and labor for its application seemed very high. Also, in the interest of sound soil management, it hardly seemed reasonable to employ a chemical agent which, although it might kill weeds, would also destroy a goodly percentage of the soil micro-organisms and soil-borne insects.

Although methyl bromide is slightly heavier than air, it was known that when used in greenhouses for soil sterilization, it had to be applied under some form of air-tight cover to keep it in close contact with the soil surface.

When the exploratory trials were conducted during 1949 and 1950, durable plastic covers were too costly and not available in large sizes. In the initial work, waterproof paper was used. Following the first set of small-scale pilot trials, reasonably large paper surfaces measuring 11½ by 100 feet were obtained. As the trials proceeded, experience soon demonstrated that paper in any form was not satisfactory for regular field operations. The paper became soggy during the treatments from absorbing soil moisture and dew. All types of paper obtainable were subject to puncturing by soil particles during and after the treatment.

Data available when the trials were initiated indicated that on most soils, weed seed could be destroyed throughout the germinating soil layer by applying methyl bromide at the rate of 1 pound per 100 square feet of soil surface. Information from the representatives of chemical manufacturers indicated that if the dosage was increased to 3 or possibly 4 pounds per 100 square feet, damping-off organisms also could be controlled for at least a reasonable period of time.

Although the trials included both high and low rates of application, the work for the most part was centered around the 1-pound application rate. This was done because the main interest and problem at this nursery was weed control rather than soil sterilization to destroy the various damping-off organisms.

Trial plot treatment consisted of using waterproof paper as a cover with 1-pound cans of methyl bromide. Gas from the cans was introduced to the area under the paper cover by means of an "applicator" available on the market. This device punctured the cans and distributed the gas under the covers through a plastic tube outlet.

In spite of the problems caused by the necessity of working with poorly adapted equipment, the treated plots gave almost completely weed-free stands of black locust (*Robinia pseudoacacia* L.), cottonwood (*Populus deltoides* Marsh.) and multiflora rose (*Rosa multiflora* Thunb.) Carefully maintained records on the cost of the treatment and the increased quality and vigor of the stock grown on the treated plots clearly indicated that the procedure was economically feasible and came closer to giving complete weed control than any other previously used technique.

Developments in Equipment

The major problem was to find a more durable type of cover and, if possible, a source of methyl bromide in large cylinders under pressure.

Several 13½- by 100-foot tarpaulins of polyethylene or vinyl plastic with a film thickness of .004 inch size were tried and found very satisfactory. The 13½- by 100-foot size was selected as most suitable for work at this nursery because it permits covering two adjacent 4-foot beds separated by a 2-foot aisle. The September 1950 price of the tarpaulins was $0.151 per square foot. Unlike paper, they did not absorb moisture, were light in weight, yet tough and resistant to tears or puncturing. So far as can be observed they are not affected by ordinary exposure to the elements. If reasonable care is exercised in their handling and storage, they should last for several years. Small tears or punctures caused by contact with sharp objects are easily repaired with masking tape. Larger holes can be covered by cementing a section of the plastic film to the tarpaulin with plastic cement.

Although recent practice still involves the use of the 1-pound cans of methyl bromide, it is expected that by the fall of 1951, pressure cylinders of 175-pound capacity will be used. These will be connected to measuring dispensers to control the rate and total amount of gas released at any

FIG. 1.—Treating nursery soil with methyl bromide, showing ridge boards, injecting tubing, and plastic tarpaulins. In background, tarpaulins are being sealed at edges with earth in preparation for injection of gas.

FIG. 2.—Injecting gas under tarpaulins from 1-pound cans of methyl bromide. Operator has placed can in applicator and has just punctured the can. Notice plastic full-view face mask worn by operator.

one time. We expect also to devise an outlet system of pipe which will do away with the need for plastic tube outlets.

Current Methods and Procedure

The use of the methyl bromide technique on a full-scale basis was inaugurated in the fall of 1950. Operations were started at this time because most of the seedings at this nursery are made in the fall; however, methyl bromide application for spring-sown species also was made early in 1951. A total of 7 acres was treated.

Under present practice, the soil to be treated is brought to a good tilth and the beds formed. For most effective treatment the soil should have sufficient moisture for good working conditions and a temperature above 50 degrees F.

Then, ridge boards, usually consisting of bed boards of 1-inch material, 4 to 6 inches wide, are set on edge along the center line of each of the two beds to be treated. These boards provide supports which hold the tarpaulin 4 to 6 inches above the soil surface. Current practice is to make these boards self-supporting by nailing 1 by 4 by 12-inch pieces along the bottoms to act as supporting feet.

Three plastic tube outlets for the gas are then laid at points 15, 50, and 85 feet along the 100-foot length of the tarpaulin covering. The tubes extend from about three feet outside the area to be covered, with the outlet ending on a center line along the longitudinal axis of the tarpaulin (Fig. 1).

The methyl bromide is released under considerable pressure when the cans are punctured. This causes a refrigeration effect at the outlet and results in a temporary liquefaction of the gas. To prevent undue absorption of the liquid into the soil immediately adjacent to the outlet, each tube is provided with a splash pan to hold any liquid until it has a chance to volatilize and disperse. Tin pie plates or pieces of rounded guttering, cut and folded to close the ends, make very satisfactory splash pans. As a part of this operation, the entrance end of the tubes, which lie outside the area to be covered with the tarpaulin, are attached to the "applicators" which puncture the cans of gas.

After both the ridge boards and plastic gas tubes are set up, the tarpaulin is set in place over the two beds being treated. With the bed and aisle widths used at this nursery, the longitudinal edges of the tarpaulin are in the aisles immediately adjacent to the two beds. After the tarpaulin is in place and pulled over the ridge boards to give a "tent" effect for the free circulation of the gas, the edges are sealed with a mound of earth 4 inches high and 10 to 12 inches wide.

When the soil seals are completed, methyl bromide is introduced, using the applicators in accordance with the manufacturer's instructions (Fig. 2). Each tarpaulin has a net coverage of 1,300 square feet and requires 13 pounds of methyl bromide at the rate of 1 pound per 100 square feet.

The covering remains in place for 24 hours after the gas is introduced to permit the gas to circulate and permeate the soil. The tarpaulin is then removed and the soil left to aerate for 48 hours, after which the land is ready for either seeding or transplanting.

Discussion and Results

Although the procedures and materials currently in use at Elsberry are most satisfactory under present operating conditions, at other nurseries it may be desirable to consider some minor modifications. For example, tarpaulins 10 feet in width, if suited to the bed arrangement, require only one ridge pole, and will shed water better.

If wider tarpaulins are used, supports so high as to cause billowing in a wind with a possibility of breaking the soil seal should be avoided.

Bed boards used for ridge poles should be completely wrapped with durable paper to avoid puncturing of the tarpaulin.

A more easily-handled and permanent type of ridging may be constructed of ¾-inch pipe. Wooden blocks or small metal feet should be provided to hold the pipe about six inches off the ground. The ends of the pipe should be covered with friction tape or masking tape,

and sharp edges or burrs removed with emery cloth.

Regardless of the type of ridge poles employed, they should not extend the full length of the tarpaulin. At Elsberry, 90 feet of ridge pole is used for each 100-foot tarpaulin. This provides a "tent" effect at the ends as well as along the sides.

In large-scale operations, it is best to prepare a series of adjacent beds at one time. By so doing, the field can be split up into two, three, or four sections for treatment. As the various sections covered by the tarpaulins are treated, the tarpaulin need be uncovered on three sides only and then turned over on the axis of the remaining sealed edge. This fold-over procedure not only reduces the amount of soil sealing to be done but also gives a more complete treatment along the edges than if the tarpaulin were completely moved.

While no specialized mechanical equipment has yet been devised to replace making the soil seal by hand, a partial soil seal with considerable saving in time and effort can be obtained by running a small hand walking plow along the edge of the tarpaulin. The edge of the tarpaulin is placed in the bottom of the furrow and then covered by running another furrow alongside.

A set of 20 tarpaulins each 13½ by 100 feet with the essential accessory equipment will permit the treatment of four 500-foot sections (0.62 acres) per day. Twenty-seven tarpaulins in the 16- by 100-foot size permit the treatment of one acre per day.

Using the procedure as outlined, both on a trial and full-scale basis, it has been possible to reduce the net costs of hand weeding at Elsberry by $550 per acre.

The stock produced on treated soil has given sufficiently better stands to justify some reduction in seeding rates and has resulted in planting stock of much better quality and vigor (Fig. 3).

The question of seriously upsetting the biological balance of the soil through the destruction of essential soil organisms is apparently not a serious one. It is the opinion of several soil scientists, entomologists, and pathologists, with whom the subject has been discussed, that the soil is rather quickly and effectively reinoculated by organisms which persist in the horizon below the affected soil layer or by new organisms brought in by wind or by the first rain.

While complete analysis has not been made at Elsberry to determine the soil pest control obtained by methyl bromide, examinations of the soil at Elsberry by Dr. Phillip Stone of the University of Missouri reveal that treated soil is free of nematodes while untreated soil is not. Growth rates being obtained this year support these findings and may be almost as important a factor as weed control.

Cottonwood, commonly acknowledged as a difficult crop to grow because the seedbeds must be kept moist during the germination period with a resultant high population of weeds, has been grown on methyl bromide treated soil with no hand weeding whatever. One-year cottonwood seedlings grown under these conditions gave superior stands because there was no loss of delicate seedlings through weeding. These seedlings also produced stock 22 inches higher with ⅛ inch greater caliper than seedlings grown in untreated soil.

During the current growing season (1951) a planned production of 3,500,000 multiflora rose seedlings, with seeding rates governed by accurate germination tests, has resulted in a stand of nearly 6,000,000 plants. Fifty percent of these had attained a height of 15 inches or more by June 30.

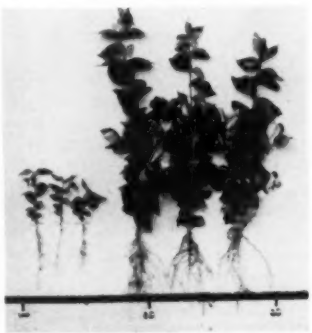

FIG. 3.—Methyl bromide soil fumigation often produces plants with increased vigor and growth as evidenced by the honeysuckle plants at the right. Check at the left.

Methyl bromide, despite its advantages, has not given 100-percent control throughout the year at the Elsberry Nursery. From observations still in progress it would appear that the effect of methyl bromide is limited to killing only those seeds close enough to the surface to germinate under ordinary conditions. Also, the effects of methyl bromide are limited entirely to the area under the tarpaulin.

Methyl bromide is a highly toxic gas requiring the following precautions:

1. Provide workers with plastic face protectors to insure against effects of inadvertent release of the gas.
2. Check the gaskets on the applicators carefully and often to see that they are not faulty.
3. Keep a sharp point on the puncturing device for the release of gas from 1-pound cans.
4. When removing tarpaulins from treated soil on windless days, have the labor crew work quickly and move away from the immediate area for 15 to 20 minutes until any remaining gas in the air is dissipated.

The amount of hand weeding necessary on treated soil varies from none to that required by a very light stand of weeds. These variations are probably caused by three factors: (1) an occasional leak in the soil seal, causing imperfect fumigation, (2) wind-blown seed deposited on the beds after they are treated, (3) water borne seed which is sometimes introduced when parts of the nursery are temporarily flooded.

Conclusions

Methyl bromide treatment of nursery land provides a completely non-selective method of weed control without leaving any harmful residue in the soil. Depending upon the quantity of material used per unit area, it provides essentially complete control of weeds as well as excellent control of damping-off organisms.

While its known effects are limited to seeds and organisms existing in the soil at the time of treatment, it gives effective control of such existing soil pests as white grubs and nematodes.

Fall treatments of methyl bro-

mide were completely effective in controlling winter annuals, most of which have had to be removed by hand weeding in the past.

Costs, including labor and amortization of equipment over a 3-year period, amount to $335 per acre per year.

Experience on both trial and full-scale bases at Elsberry during three growing seasons show a net saving in weeding cost of $550 per acre.

While this type of treatment destroys all or port of the soil organisms in the horizon within a few inches of the soil surface competent soil scientists and pathologists indicate that this effect is temporary, the soil being quickly reinoculated with new organisms carried in by wind and rain or by somewhat more gradual inoculation from organisms which persist below the affected soil layer.

Although methyl bromide has not proved 100 percent effective on every square foot of seedbed area, its effects both as to weed and insect control at Elsberry make it a most promising tool in the production of cheaper and better nursery stock.

If reasonable precautions recommended in the manufacturer's instructions are followed, methyl bromide may be used effectively and safely in nursery operations.

Utilization Trends in the Central Hardwood Region[1]

Roy C. Brundage
Purdue University, Agricultural Experiment Station, Lafayette, Ind.

THE BOUNDARIES of the central hardwood region have included many states at different times but for this discussion is confined to the region now designated by the U. S. Forest Service as the Central States. This includes Ohio, Kentucky, Indiana, Illinois, Missouri, and Iowa.

Westveld (*9*) in describing this area recognizes three divisions based upon the character of the timber, land ownership, and topography. These are:

1. The corn belt which extends across the northern half of Ohio, Indiana, and Illinois into Iowa.
2. The hilly uplands that extend back from the Ohio River.
3. The Ozarks of lower Illinois and Missouri.

In the corn belt the forests are small farm woodlots. There are also many farm woods in the other areas but these average larger in size. In addition there are some sizeable blocks in industrial ownership. State and federally owned lands in the Central States account for about 6 percent of the forest land (*1*).

Utilization in the Central States deals largely with hardwoods, for they cover more than 95 percent of the area and make up about the same percent of the total timber volume cut annually (*1*). In only two states, Kentucky and Missouri, does the volume of softwoods cut exceed 5 percent of the total cut in those states.

Approximately 1,098,000,000 cubic feet[2] of timber were cut in the six states mentioned in 1944. The distribution of this cut by products is as follows:

		Percent
1.	Lumber	41.0
2.	Fuelwood	34.0
3.	Fence posts	9.0
4.	Mine timbers	5.2
5.	Cooperage	4.0
6.	Hewn crossties	1.0
7.	Handle	1.5
8.	Veneer	1.0
9.	Pulpwood	3.0
10.	Other	0.3

The fuelwood, fence posts, and part of the lumber are consumed on the thousands of farms of this area. This accounts for some 40 to 45 percent of the total cut. The remainder of the cut goes to the various primary industries. These may be classified according to the quality of timber they use.

I.—Industries that require high quality timber.
1. Large and medium sawmills. (Those that produce at least 1,000 M bd. ft. annually and some that produce 500 M bd. ft. or more.)
2. Veneer mills.
3. Handle plants.
4. Cooperage mills.
5. Specialty plants.

II.—Industries that use low to medium quality timber.
1. Small sawmills.
2. Pulp mills.
3. Mining industry.
4. Miscellaneous industries.

The industries that utilize the high quality timber seek such species as white oak, black walnut, white ash, tulip-poplar, sweet gum, sugar maple, cherry, and red oak. In fact, so great is the demand for high quality timber that the secondary industries bring in approximately 38 percent of their hardwood requirements from outside this region.

The sawmills are by far the most numerous of all the primary industries; 9,262 active mills were listed by the Bureau of Census in 1947 (*3*). These produce about 1,200,000,000 board feet annually. The lumber is used by a host of secondary industries that manufacture from four to five thousand different products ranging from furniture and flooring to toys and novelties.

The proportion of the total amount of lumber used for furniture and flooring in this area has increased in recent years, as has that for boxes, baskets, crating, and recreational equipment.

Utilization of Oak

Oak types predominate in the region; therefore, it is not surprising to find that 45 percent of the total amount of lumber produced is oak, and much of the forest economy

[1] Adopted from a paper given at a meeting of the Division of Forest Products, Society of American Foresters, Washington, D. C., December 15, 1950.

[2] Data for Missouri and Kentucky taken from U. S. Forest Service survey and reappraisal reports. Data for other states were obtained from *Forest Resource Appraisal*, American Forestry Association.

of the region is concerned with the consumption and production of oak timber. The extent that oak plays in the economy of the Central States is shown in the following examples.

Producers of oak lumber had a heyday during the period around 1900 to 1910 when golden oak furniture was in demand. Following this, came the mission oak period and, from around 1920 to 1940, other woods took the lead in popular demand. This was the lean period for producers of oak furniture stock and, of course, for owners of oak stands.

About the beginning of the forties the light colored furniture styles caught the home-makers' fancy. At the same time, new bleaching methods had been developed and a new finishing process was discovered which was partially responsible for putting oak back near the top in popular demand for furniture. By using white paint as the first step in the finishing of oak and leaving just enough in to fill the pores, a light effect was obtained that fitted it to the popular demand for light furniture.

Another discovery in a veneer plant in central Indiana brought forth a new design in white oak veneer. The demand for this veneer soon had buyers scouring the central states for soft-textured white oak preferably 18 inches and greater, d.b.h., and bidding fabulous prices for stands containing trees of this quality.

One afternoon at Hill Brothers it was necessary to take a flitch from the veneer machine to make a repair. When it was replaced and the sheets of veneer began coming off, it had been reversed. The knife was then striking the rays at an angle that was just right to give a comb-grained effect. The owner noticed this, and began experimenting to get the same effect from other flitches. The veneer trade and the consuming public liked it and thus, like many other instances in American industry, another production technique was developed from an adverse or unscheduled procedure.

The production of crossties is another important industry in most of the Central States. During the early thirties, when the gold standard was a world wide issue, a tie producer of the hill country of southern Indiana remarked that he was not worried about the gold standard, for the tie producers there were on a "crosstie standard." So long as the railroads accepted ties or so long as credit was given by local stores or bankers, he and other tie producers and the farmers from whom they purchased stumpage would be able to make a living. The tie market declined in the depression and it affected a large segment of the area in the central states, but the production of oak and other hardwood crossties is still an important industry in most of the upland area.

The stave industry is another that draws upon oak stands for its product. Until 1920, this industry spread out over the more heavily forested areas of this region and heavy cuts were made for white oak. With the advent of prohibition the stave market moved out of Ohio, Indiana, and Illinois. After the repeal of prohibition and to some extent, through the influence of Timber Production War Project foresters who did much to increase market outlets, the stave industry moved back into the central states area north of the Ohio River and the stands again were "creamed" of white oak timber that had grown up to merchantable size during the intervening period.

This heavy demand for white oak has brought about a silvicultural problem: that of obtaining regeneration. The concentrated removal of white oak from stands already under-stocked and often heavily grazed results in unfavorable seed bed conditions for white oaks. (9)

Utilization of Hickory

Hickory is also a problem species in the area because of technological changes. Until about 1930, large amounts of hickory were taken for motor and non-motor vehicles. About 20 percent of the lumber consumed in 1928 in four states (Table 1) was used in the manufacture of vehicles. Hickory at that time was used for automobile wheel spokes, tops, and other body parts. The change-over to all-steel automobile wheels and all-steel bodies took away this market as did the decline in the use of non-motor vehicles. By 1940, only 5 percent of the lumber consumed was for vehicle stock and the big market for hickory no longer existed.

Where there are handle plants or a few other industries that use hickory there is a ready market, but over considerable area hickory has been building up in our stands. Data obtained on some stands in southern Indiana show that this hickory makes up 15 percent or more of the volume. U. S. forest survey figures for Illinois and Missouri show that the volume of hickory in commercial stands is 6 to 7 percent. Here is another utilization problem which needs solving. It typifies the fact, too,

TABLE 1.—PERCENTAGES OF LUMBER USED BY WOOD MANUFACTURING INDUSTRIES IN ILLINOIS, INDIANA, OHIO, AND MICHIGAN[1] IN THREE DIFFERENT YEARS[2]

Type of industry	1928	1933	1940
Agricultural implements	2.4	0.5	1.6
Boxes, baskets, and crating	17.7	29.6	30.4
Car construction and repair	3.2	1.6	1.4
Caskets	0.9	1.9	0.6
Domestic fixtures and appliances	5.3	3.4	5.6
Furniture	25.3	26.7	28.4
Flooring	1.0	7.6	7.8
Recreation equipment	1.4	1.7	2.9
Sash, frames, and milling work	18.1	8.0	12.1
Vehicles—motor	19.0	12.8	4.7
Vehicles—non-motor	1.5	0.8	0.4
All other products	4.1	5.4	4.5
Total all products	100	100	100

[1]Michigan was included in this table because it took large quantities of lumber for furniture and motor vehicles from the Central States.

[2]Basic data from which percentages were obtained were taken from the publications *Lumber Used in Manufacture in 1928, 1933* and *1940*, U. S. Forest Service reports.

that no matter how badly good management practices call for the reduction of hickory in central hardwood stands, if there is not a profitable market outlet it remains in the stands. The Forest Products Laboratory is conducting research to find new uses for hickory. Success from this endeavor would be a boon to paving the way for better management of oak—hickory stands.

Utilization of Beech

The utilization of beech from the beech-maple type in the area is also of major concern. Where there are basket plants or other specialty plants that can use beech, harvesting of this species is profitable. The logs must be of good quality for rotary veneer.

One Indiana firm that makes clothes pins will take beech logs that have up to an 8-inch hole in the center if the logs are otherwise sound and relatively clear. Such logs are cut into boards ¾-inch thick and these pass through a series of gang saws that reduce them to pieces ¾ x ¾ by 4 inches.

Few other markets exist for beech, but when they do, owners have a good opportunity to translate such a marketing advantage into the improvement of their stands. Two such cases that occurred during the last war will illustrate the point.

The first was a market for high grade beech veneer for the construction of air craft in Great Britain. A firm in central Indiana got this order and paid from $75 to $80 for high grade beech logs, delivered. This was a high price for beech. A basket plant in the area had had a top price of around $50 before the war. Woodland owners adjacent to this market who were aware of this opportunity sold their beech for a good price and improved their stands at the same time.

The other case involved the removal of low grade beech timber from a stand in northern Indiana. What would ordinarily be cull beech was used for cribbing on a sewer construction job in Chicago. The lumber had only to be sound enough to hold back the ditch banks while the tile was put in place.

The utilization pattern that has prevailed in the Central States region through the pioneering and development stages has paralleled those of other hardwood regions. Cutting has been done with little thought given to maintenance of stands. Livestock grazing in the corn belt and fire and grazing of the upland area have contributed greatly to the deterioration of the stands.

The central states has, therefore, a high percentage of second growth stands that are in need of improvement cuttings. Markets are needed to make these cuts practical.

In the recent survey of forest resources of Illinois (2) it was found that in the saw timber stands, "less than one-third of the volume was in grade 1 and 2 sawlogs."[3] This report further states that these logs produce the high quality material required by the cooperage, veneer, and furniture industries. The large proportion of low quality timber presents a serious problem in forest utilization and management. For the Missouri Ozarks, Quigley (7) also states, "Forest Survey Figures . . . . show that 39 percent of the total cubic foot volume is in cull trees."

While the proportion of qaulity timber may vary in the other central states the situation is more or less comparable. The problem is to maintain a flow of high quality material to those industries that require it and to find profitable means of utilizing the over supply of low grade material. Buyers representing veneer firms, the cooperage industry, and the large sawmills make beaten paths to the door of those who own high grade stumpage but the cry of those, whose timber is of low quality is, "Where is there a market for my timber?"

[3] *Grade* 1.—Logs at least 14 inches in diameter inside bark with five-sixths of the surface on the three best faces clear of defect in not more than two cuttings. Lumber from such logs will normally grade at least 60 percent No. 1 Common and Better.

Grade 2.—Logs at least 12 inches in diameter inside bark with two thirds of the surface on the three best faces clear of defect in not more than three cuttings. Lumber from such logs will normally grade at least 35 percent No. 1 Common and Better.

Grade 3.—Merchantable logs at least 8 inches in diameter inside bark which do not meet the requirements of higher grades. Such logs will normally produce less than 35 percent No. 1 Common and Better lumber or will be suitable only for ties or timbers.

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Grazing on the Texas National Forests[1]

Paul Y. Vincent
U. S. Forest Service, Lufkin, Texas.

THE RELATIONSHIP of cattle growing and timber production in the piney woods is somewhat comparable to that of a sharecropper and a scientific farmer. The stockman, like the sharecropper, has been with us for a long time, but neither has made much improvement; while the forester, like the farmer, has taken advantage of science and has improved production and increased the value of his enterprise. The stock grazing business has made improvements, but not where the stock are grazing in the open piney woods range.

When the national forests of Texas were put under formal administration in 1936, grass was recognized as a resource in keeping with the "multiple use policy" of the Forest Service. A range investigator was sent to the forest to make a survey and plan for administering the resource. The plan was technically a good one, but after considering it from a practical viewpoint, it was not put into full operation because: (1) the scattered pattern of national forest ownerships made management difficult, (2) most of the forest was already over-grazed, and (3) insufficient funds were available to provide for intensive grazing management or to construct allotment fences and other improvements. Furthermore, the rangers and supervisor were quite aware of the undesirability of upsetting a time-worn tradition of uncontrolled open land grazing, particularly when stock grazing on the forest seemed to be declining. As one ranger stated, "Cows are worth $12, calves $9—not enough money to encourage a stockman." The stock dipping law had become effective, but stockmen were selling their animals rather than follow the program. Timber was increasing and grass was decreasing on the forest areas. However, it was thought that some demand for grazing would always come from the local people, and that this should be met when suitable areas were available. There was no plan for large commercial grazing similar to that in the West.

The tabulation below shows the number of live stock on open range and under permit or control on the Texas national forests between 1937 and 1947. Sheep, goats, and hogs were not, and still are not, permitted on forest land. "Open range" in the South refers to land on which stock graze uncontrolled by fence and without regard to ownership. Figures in the tabulation uphold the original assumption by the rangers and supervisor that the number of stock would decrease on the open range on national forest lands. The 1951 figures may be even less than shown because the dry season has forced many stockmen to sell heavily. The upward trend in permitted stock reflects the influence of stock laws requiring fencing in two counties, and that the more progressive ranchers are requesting permits for fenced or closed areas to control their better grade of cattle.

	Open range			Closed areas Permitted	
Year	Cattle	Sheep and goats	Hogs	Cattle and hogs	Permits
1937	35,000	3,500	30,000	0	0
1942	18,000	2,700	21,000	1,800	58
1947	16,500	800	11,000	1,300	56
1951	15,000	500	10,000	2,000	74

Grazing use from 1937 to 1946 was considered and administered as a rather minor secondary resource. The national forests provided small special use pastures for local farmers, or grazing permits for the larger stockmen in fenced plantation areas. Many fenced areas were abandoned 1 to 3 years later because the stockmen found that the enclosed pastures would not support cattle, even with supplemental feeding. The closing timber canopy was rapidly reducing the volume of grass.

In 1947 another look was taken at the grass resource in the light of an apparent increase in demand for fenced ranges. The increase in demand came not only from local people but from outsiders, particularly from several larger stockmen in southwestern Texas. The demand from local people was from two causes: (1) The better quality of stock seemed to be forcing the local stockman to fence pastures so that his animals would not become mixed with the open range type—that is, so he could get the maximum benefit from his high priced bulls; and (2) in several of the counties stock laws were passed which required the stockman to keep his animals under fence. The increased demand required a reconsideration and re-evaluation of the relationship of timber growing and cattle grazing on forest land. There was also the question of grazing as an aid in reducing fuel, thus facilitating protection from fire, and the possibility of increasing revenue from grazing.

The progress of the stockman in the piney woods was indicated by one of them at a pasture meeting sponsored by the Soil Conservation Service. About 200 farmers and stockmen attended. One old fellow, talking to a group of his cronies, made a statement which is indicative of a trend of thinking by the stockmen. He said, "You know, fellers, I farmed for 30 years, workin' my heart out, tryin' to grow cotton, corn, and peanuts, and was just barely makin' a livin' while my neighbor, a young feller, got into this pasture business and put some good cows on it. He was makin' money. While I was out choppin' cotton, he was settin' on his front porch lookin' at his cows. So I done some thinking and decided if he could make money settin' on the porch, I could, too. So I got into this business and I'm tellin' you fellers that this improved pasture thing is the best

[1]Paper presented at a meeting of the Division of Range Management, Society of American Foresters, Biloxi, Miss., December 14, 1951.

deal that has hit us yet."

The old man had a point and he stated it very well. It is obvious that improved pastures in and around the forests are increasing, and also that the quality of cattle on these pastures is improving.

The possible importance of grass is shown by a statement by Dr. V. A. Young of Texas A & M College. In studies of cattle and grazing in Texas, he found that about ten years ago two-thirds of the total number of animals were located in western Texas, but now two-thirds of them are located in eastern Texas. This is a significant change in distribution. Cattle from western Texas are being moved to eastern Texas and put on fenced ranges or improved pastures. As far as we can tell, there is no increase of cattle on the open range.

Why this demand for grazing in eastern Texas by western Texas cattlemen? Fifteen years ago I traveled through Texas, from El Paso to Texarkana. I recall vividly the height of the grass in the western plains country. In the summer of 1947 I traveled through the same country. First, I noticed a browse line in the scrubby timber and next the lack of grass. For miles all one could see was rocks. One could walk miles on rocks and never touch soil. So I can understand why the cattle distribution has shifted from west to east. Eastern Texas probably looks like a cattleman's dream with 4-foot grass and plenty of water, even discounting the lack of grass of high palatability.

Thus, the redistribution of cattle, the establishment of stock laws, the improved quality of cattle, and the success of the improved pasture program, clearly indicated that grazing policies should be seriously reconsidered. Accordingly, a new policy statement and plan was prepared for the Texas National Forests coordinating grazing with timber, wildlife, recreation, and watershed protection. The revised policy statement and plan was not as technically comprehensive as the original plan, but was based on current conditions and the need for practical grazing administration. The objective, in general terms, was: "To develop and maintain range use consistent with local needs, ecological conditions, and economic situations, particularly with a view of increasing and developing the production of timber." Supplementing this general broad objective statement, the policy items agreed upon were: (1) That formal grazing management should be confined to fenced areas; (2) that national forest grazing facilities and resources should be utilized to supplement privately owned improved pastures; (3) that sound agricultural practices, including improvement in grade of stock, should be recognized; (4) that preference would be given to local residents on the basis of supplementing other agricultural activities, including their timber and woods work; (5) aim eventually to exclude hogs, sheep, and goats from longleaf plantations and placing emphasis on exclusion of cattle from bottomland forests; and (6) that necessary deviations would be permitted at the discretion of the forest supervisor.

The policy clarifies grazing administration. Certain limitations in available knowledge and information were recognized. Four special needs were listed for follow-up study. These were: (1) Proper stocking and season of use for forest grazing lands; (2) the relationship of improved pastures with open or fenced national forest grazing lands; (3) the relationship of grazing fire, and timber management; and (4) how best to educate the farmer and stockman in proper use of forest grazing lands. Study does not mean regular research projects but observation and reporting by the rangers on the particular problems.

Present thinking might be summarized as follows: (1) To meet local needs, cattle grazing should continue to be recognized and permitted on specified areas suitable for grazing, where it will not interfere with the production of timber; (2) proper perspective should be maintained in administering the grazing resource in relation to the primary resource of timber production; (3) grazing should be considered as a limited resource, and probably a decreasing one, as intensive timber management increases the density of the forest stands; (4) proper stocking, season of use, and distribution, will minimize damage to timber stands; and (5) new plantation areas, rights-of-way, and other open areas will always provide some grazing for limited numbers of local live stock.

Some Social Aspects of the Forest Conservation Problem

Charles E. Lively

Professor and chairman of the Department of Rural Sociology, and director of the Institute for Research in the Social Sciences, University of Missouri, Columbia.

MOST PEOPLE, perhaps, still think of forestry as merely a matter of growing trees. But modern forestry consists of considerably more than that. Trees must be grown, but in addition they must be protected, not only from Nature but from the public—from the people who live in or near the forest areas, and from the people who come from afar to use the forest areas for recreation and for other purposes. And therein lies a series of problems in human relations.

It is the purpose of this paper to consider some of these human-relationship aspects of modern forestry — relationships that create problem situations that menace the forests; and, in discussing these social aspects of forest conservation, we shall approach the matter from a cultural point of view. Culture is here regarded as consisting of ideas, attitudes, opinions, and socially conditioned behavior. It is this learned equipment that causes people to "behave like human beings," and, more specifically, determines their behavior toward the forests which the modern forester is attempting to grow and protect.

An examination of the history of the conservation movement in the United States shows clearly that, although the movement is now about 50 years old, it has not as yet been very successful, and never popular. Various reasons have been assigned for its indifferent success, but one valid explanation is that conservation has never been a "grass roots" movement. Rather, it has stemmed from the experts—the scientific intelligentsia, and other far-seeing leadership. At no time, generally speaking, has the man on the street, in the village and on the farm, felt a compelling need to conserve natural resources, including the forests. Perhaps the term, "conservation," itself, has not been helpful since it implies hoarding and therefore runs counter to American habits. The American people are good spenders but poor hoarders.

Another difficulty in the case of forestry may be the very complexity of the conservation concept, making it difficult for the general public to grasp its essential features with clarity. The concept is simple when applied to minerals. The mineral is there, as provided by Nature, in limited supply. The supply cannot be increased, nor will it deteriorate with time. The only problem is the rate at which it shall be used.

But it is not so with timber. If possible, the trees must be protected from diseases, from Nature-caused and man-caused fires, and yet when trees mature they must be harvested so as not to destroy the young stock. Further, new trees must be planted and cut-over areas must be restored to forest in order to prevent excessive erosion and to reduce floods. Thus, the concept of trees as a "crop," simple though it may be to the expert in this field, represents a complex of ideas and behavior patterns that the public grasps only slowly, and seldom adequately.

The explanation of the American attitude of indifference, or opposition, to forest conservation must be sought in the history of land settlement and resource development in the United States. This country was settled chiefly by farmers, and by people who wanted to farm. In 1790, when the first federal census was taken, over 90 percent of all gainful workers were employed in agriculture. Moreover, these people were convinced that the resources of this country were inexhaustible. They also believed, with the *laissez faire* economists, that the public good was served best by everyone serving his own interest; and they believed with Herbert Spencer that the best government is the least government. These attitudes and beliefs set the pattern for the most astounding and destructive exploitation of natural resources that the world has ever seen.[1] In the Ozark hardwood area, for example, lumber production dropped from 750 million board feet in 1899 to 59 million board feet in 1931. Now, with the advent of forestry building practices, production has increased to 500 million board feet, and it is estimated that a sustained yield of several times that amount can be maintained.

But, while the traditional attitude of the American public is, to say the least, one of indifference toward forest conservation, some variation in this attitude may be distinguished as one moves from group to group. For example, the typical attitude of the farmer may be characterized about as follows: trees stand in the way of farming. All good arable land should be farmed, and therefore forest trees should be limited to waste land, or at most to non-crop land. Some trees are needed for firewood, for fencing materials, for repairs, as a shade for cattle, and for a habitat for squirrel and coon. Some good sized trees may even be needed for building materials, but in the main, lumber will be bought rather than cut. He has little or no conception of timber as a crop, and never figures timber in his income except in terms of fuel used from the woodlot. He does not calculate the inventory value of timber growing on the "back forty," nor does he estimate the value of its annual growth. Most of those who do clearly grasp the value of a good stand of timber do not attempt to augment what they have because of the length of the waiting period. The American farmer is not yet in the mood to do much building for the next generation. After all, his

[1] It is unnecessary to review the story here. It has been well told in such documents as F. Osborn, Our Plundered Planet; William Vogt, Road to Survival; Stuart Holbrook, Burning an Empire; and many others.

son may not wish to farm; or, if he does, he may want to begin on someone else's farm.

And so, in the hardwood areas, the farmer is likely to pay little attention to a fire in the timber except as it endangers buildings, fences, livestock, and people. It's just a fire in the woods and can do little harm. It will destroy ticks and varmints, clear out the underbrush, and make the grass grow greener afterward.

Somewhat in contrast is the attitude of the non-farmer, urban group of people who make occasional trips to forest areas. These people are commonly both ignorant of the significance of the forests they visit and indifferent to their welfare. To them the forest is a place to go: to hunt, to fish, to camp out, to hike with camera and bird glasses. It's a place where one gets wood ticks, ivy poisoning, mosquito bites, and other annoying acquisitions. These people are thoroughly habituated to life in modern houses and on city sidewalks, and they go into the timber with their habits in good working order. They light their pines and cigarettes, toss aside lighted matches and cigarette stubs wherever they may be, empty their pipes, start campfires and leave them burning. They have no vested interest in the timber; why should they be concerned about a little fire unless the smoke annoys them or unless the fire may, perchance, endanger their chances of getting out. These people like to climb the fire tower, view the landscape, and watch the ranger triangulate an area. But they feel no responsibility for the problem he faces; only admiration for the skill of an expert.

One might go on in this manner delineating the approximate attitudes of the various groups of people who come in contact with the forests. But perhaps we have gone far enough to make clear the point that no major segment of the American public now regards the forest as essential to its survival and welfare except the lumbermen, and their business is to cut lumber rather than to protect growing trees. Their attitudes are essentially destructive rather than creative, so far as the forest is concerned.[2] Barring the conservation experts (and the nature lovers who want no trees cut) no group rises up to defend the forests and fight consistently and effectively for their permanent development and sensible use. The forest fire problem is a part of this historic cultural complex and cannot be fully understood apart from it.

In a Democracy the People Must Assume Responsibility

All people, whether their system of social organization be simple or complex, possess certain behavior compulsives which are called *mores*. These *mores* consist of inflexible rules of behavior concerning certain things which are thought to be essential to their survival or welfare. They are not primarily statutory laws enforced by police power, although many statutory laws are based upon them. Rather, they are informal, unwritten laws which have come to possess the force of custom. They are enforced by the people and form the basis of the "common law." Children are brought up to obey and respect these *mores* and, hence, everyone in the society becomes a "policeman," checking and reporting on all of his associates and members of his group to see that the *mores* are obeyed. Violators are summarily and severely punished.

Among preliterate peoples, who possess a relatively simple social organization, a high proportion of all rules of behavior fall in this class of traditional *mores*. In our society, however, the intellectual sophistication that has come from mobility, from secular education, and from the cult of science, has effectively dissipated our earlier faith in the traditional *mores*, and has gradually generated an attitude of contempt for the older beliefs that are not thoroughly verified by science. Yet fragments still remain. The age-old rule that brother and sister may not marry is still enforced with a high degree of effectiveness without benefit of the police. Every child is so schooled as he grows up, by his parents, playmates, and teachers, that he does not even consider marrying a brother or sister. Violations of the rule are rare.

In the past, the peoples that have survived have done so because (1) they clearly saw what they had to do, and (2) they saw to it that everyone complied, not through police action merely, but by training up their children to believe in the necessity of the prescribed action. Reduced to simplest terms, folk rules, group compulsives, arise out of conviction based upon necessity. People usually rally to meet a menacing situation, such as an invasion or an epidemic. Put six persons on a life raft in mid-ocean with one gallon of water, and rigid rules of use develop quickly.

In our society, it now seems that we may have gone too far toward divesting ourselves of compulsives for the public good. Many theorists have held that as the traditional, sacred behavior compulsives became dissipated, rules of public welfare based upon scientific principles would take their places as guides to public welfare. But something has gone awry. The traditional compulsives have been largely dissipated, but many of the newer tenets of public welfare, even though scientifically established, have not yet been fully accepted by the economic, social, and political leaders of society. The principle of conservation of natural resources represents a case in point.

But, even though the scientific guides to rational social behavior may be crystal clear to the leaders of society (and they are not always so), their implications for public welfare do not appear to diffuse to the masses of people rapidly enough and effectively enough to carry the sort of conviction that leads to conformity. Also, present methods of rearing and educating children in our society seem to be entirely inadequate for the task of preparing them to carry out any

[2] Many of the larger wood-using industries have become interested in rebuilding the forest resource and are engaged in programs to that end. This is largely the result of advancement in forestry and the changing economic scene which make timber-growing a practical business venture.

scientifically prescribed code of welfare ethics. The inevitable result is that the people, although enjoying a large measure of personal freedom, do not always display the restraint that is born of a well developed sense of social responsibility.

More specifically with respect to conservation, whatever behavior compulsives toward conservation our European forefathers may have had, were lost in the course of their migration from Europe and settlement in this land of abundant resources. Since then, generation after generation has been reared, knowing no protective compulsives toward natural resources; and through these generations our entire population has become accustomed and conditioned to wasteful exploitation of such resources in the dubious belief that, if and when resource exhaustion occurs, science will find a way to save us. Surely, better mechanisms for informing the people of our conservation needs, and for developing a greater sense of social responsibility toward the use of natural resources is indicated.

There are those, of course, who will advocate protecting the forests and promoting forest conservation by police methods, but it will not do. The paid policeman is effective only when he knows that the people stand by him and support his action. Lack of public support eventually ends in police corruption. In forest protection, as elsewhere, police protection is necessary, but it exists to control the minority, the occasional laggard and offender, never the majority. When majorities revolt, police become impotent. Only the people themselves can save us.

It is clear to the social scientist, therefore, that the general problem is that of changing the attitudes of the people who come in contact with, or who hold influence over, soil and forest resources. This is by no means a simple task for basic attitudes are not easily changed. Attitudes can, and do, change; but in the main such change apparently comes as a result of a deeply significant experience in the life of the person concerned. That is why so much propaganda and so-called educational material is of no consequence; it produces no such experience in the life of the people exposed to it.

An important initial step in changing the attitudes of others consists of transmitting effectively to them some concept which may form the basis of new behavior patterns. To be effectively transmitted to large numbers of people with a view to changing their attitudes, a concept must possess certain characteristics: (1) it must be *elementary*, (2) it must be *clear cut*, and (3) it must possess *stability*. Selected illustrations may serve to clarify the nature of these characteristics.[3]

"Fire is always bad for trees," represents a simple concept; but, "conservation is good for the national welfare" is not a simple concept. Too many people cannot immediately visualize in concrete terms just what "conservation" involves, or just how it affects the national welfare. As to the requirement that an easily transmissible concept must be clear cut, compare the concept of "fire," or the concept of "trees," with that of "parity." Although the term "parity" has been in constant use in the agricultural adjustment program for some 15 years and has been widely publicized, an Iowa paper has recently found five different definitions of it in use in that area.

The third requirement, that of stability, means that if the transmitted concept is to be effective in changing attitude, it must not change frequently. The reason is that to change attitudes by educational means usually requires time. "Fire is bad for trees" represents a stable concept; for, generally speaking, fire is *always* bad for trees. But, compare that with the buck and doe relationship in wildlife conservation. When the deer population is small, it seems best to take only the buck and the hunting public is educated to do that. But soon after that end is achieved, Nature and public restraint contrive to increase the deer population to the point where both buck and doe should be taken to prevent predatory developments and mass starvation. At this point, an objecting, incredulous public must be re-educated. But, by the time this change in attitude has been successfully effected, Nature and man have contrived to reduce the deer population to where only the buck should be taken, and the educational process must begin all over again. Thus, we see that the unstable concept presents serious difficulties to the person engaged in mass education.

But the effective transmission of a new concept, or idea, does not necessarily result in correspondingly new habits of thought or action. Unless there is motivation, the will to do, not much is likely to happen. It has long been recognized that such motivation can often be supplied by relating the new idea to the self-interest of each individual. But self-interests vary, and not all interests are equally effective as motivators to any particular action. Furthermore, the mass educator can seldom know enough about the interests of his public to determine which ones are likely to prove most effective for his purpose. This is particularly true in the area of forest conservation. If, for example, it were possible to obtain better, more detailed classifications of the people who cause forest fires, it would be helpful in planning more effective campaigns of prevention; but it is not an easy matter. At present we seem to be unable to get much beyond the recognition of broad groups of people who have some direct relation to the forests in areas of varying fire hazard, such as the conifers and hardwoods. Thus, from one point of view, we may think of three groups of people who may be involved in woods burning: (1) *People who live in the forest and are closely identified with it.* This relatively small group is likely to be more sensitive to forest welfare than most other groups, particularly if they live in a forest that rates high as a fire hazard. (2) *Farmers who*

[3]Other excellent illustrations may be found in Ogden, *These Things We Tried*, University of Virginia Extension, 1947. See especially ch. 14.

live nearby the forest. They are likely to have little respect for the forest and are commonly indifferent to its benefits, especially in the hardwood areas and in areas where strong emphasis is placed upon successful farming. (3) *People outside forest areas.* These are chiefly nonfarmers and townspeople who go to the forest area for recreation and diversion. If they become involved, it is mostly because of ignorance and carelessness. The relative importance of these three groups as woods burners, of course, varies both in place and time. A forest area overrun by city recreationists presents a different problem from that of a forest burned by local farmers for traditional or other cultural reasons.

From the point of view of immediate motivation, we may recognize *deliberate woods burners* and *accidental burners.* The first intentionally set fires, sometimes as protest or reprisal, sometimes to kill "varmints," sometimes for diversion. Accidental burners have no deliberate intent; they are merely careless with fire, or ignorant of its potentialities. Typically, they drop a lighted match or cigarette stub, or fail to extinguish a campfire.

But such broad classifications, though useful, are not sufficient to reveal the specific characteristics of the people who are responsible for starting forest fires. Is there an age concentration of those who start fires? From what socio-economic, occupational, and educational classes, or levels, do they come? Are such fires more often started by single individuals, or by two or more persons moving and acting as a group? The answers to these and similar questions would be valuable. If more were known about the specific individuals who start fires in each broad forest area, where they come from, what their habits of life and work are, what they were doing when they started the fire, and just how they started the blaze, educational programs could be made more specific, and, therefore, presumably more effective. However, such statistics, if not impossible, are extremely difficult to obtain.

What to Do

Time and social change are admittedly the supreme factors in changing the attitudes and values of men. Here, however, we are concerned with the development of man-made programs that will not only shorten the time factor but will with some degree of certainty produce attitudes more favorable to forest conservation. Only a few of those that appear most promising can be listed here, but they may serve to suggest many others to the reader.[4]

Suggestions Relating to Mass Education

1. Test all posters, movies, etc., before releasing them to see that they produce the desired effect. The devastating results of a fire are no doubt more effective for this purpose than a picture of the fire itself.

2. Stress action, things to do, rather than merely ideas.

3. Don't overload the subject matter. Attempt to convey only one idea at a time.

4. Vary educational materials for different areas and groups in terms of their particular interests and problems. Let local leaders participate in the selection and preparation of materials.

5. Prepare special materials for the public schools. These should embody art, dramatics, geography, and social studies.

6. Give wide publicity to forest fires and link them with national defense.

7. Stimulate local "grass roots" movements adapted to the area, such as the "Keep Oregon Green" movement.

8. Promote youth clubs in forestry and nature study similar to the 4-H Clubs.

9. Search out the local leaders in strategic and dangerous areas, and hold short courses for them; not in fire fighting, but in the meaning and value of the forest to them and their neighbors.

10. Give particular attention to cultivating and educating sportsmen's groups. Their magazines are effective; use them.

11. Join hands with the Agricultural Extension Service and develop effective programs of farm forestry. County extension agents with training in forestry are helpful when located in forest areas.

Suggestions Relating to the Forest Service Personnel and to Research

1. Induct a limited number of trained social scientists into the U. S. Forest Service at both the national and regional levels. Provide for research in human relations with respect to forestry and the use of forest areas.

2. Make studies of human behavior in forest areas, and of the incidence of man-caused forest fires, particularly in troublesome places. Make studies in areas where marked change for better or worse has occurred with a view to determining what has effected the change.

3. Introduce more social science into the training of foresters, both as a part of the curricula in the schools of forestry, and by means of short courses for field personnel.

[4] The suggestions given here are not original with the author of this paper. Most of them were developed by the National Advisory Council on Human Relations (a creation of the American Association for Advancement of Science) in conference with the personnel of the U. S. Forest Service during the years 1939-45. The author was a member of the council and served as its secretary during the entire six years.

Notes

A Small-Tree Diameter Gage

The diameter gage shown in Figure 1, has been made and used successfully at the Northeastern Forest Experiment Station's Penobscot Research Center at Bangor, Maine. It was designed for making sapling tallies where size by 1-inch classes is required.

The instrument was made from ¼-inch aluminum-magnesium alloy that has combined advantages of light weight and durability. The outline of the tool was first scratched on the metal. Then a hacksaw and file were used to cut and shape the gage to the required dimensions. A hole was drilled through the small end to hold a loop of cord or a leather thong for suspending the gage from the wrist.

The step graduations or notches have the following widths: 0.60 inch, 1.55 inches, 2.55 inches, 3.55 inches, and 4.55 inches. Thus, the gage works on the "go or no-go" principle, sorting all saplings by inch diameter classes from the 1-inch class through the 4-inch d.b.h. class. Any tree that fits the smallest notch is below the 1-inch class; one that is too large to fit the largest notch is above the 4-inch class.

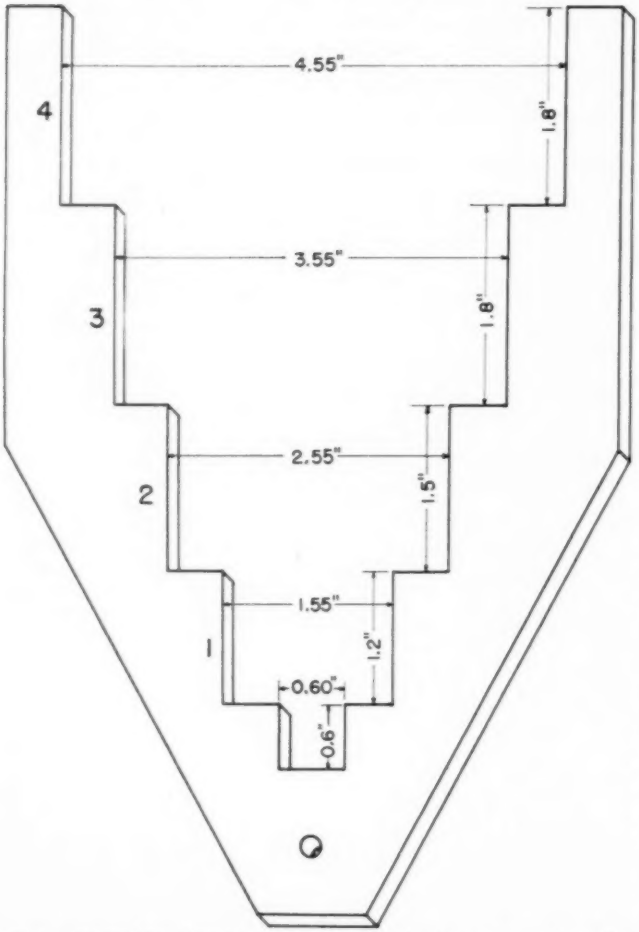

FIG. 1—This small tree diameter gage, made of a light aluminum-magnesium alloy has proved to be a time-saver, especially in measuring 1- and 2-inch trees.

The diameter gage has many advantages over both diameter tape and calipers. It is easier and quicker to use and to read. There is less chance of error, particularly on 1- and 2-inch trees. Its use saves a great deal of wear and tear on diameter tapes, which, aside from being somewhat unreliable on very small trees, are subject to severe bending and occasional breakage. There are no moving parts to become broken or lost, and the gage is only half as heavy as a diameter tape.

WALTER J. KIDD, JR.,
Research Forester,
Northeastern Forest Experiment Station,
U. S. Forest Service,
Upper Darby, Pa.

Destruction of Paper Tree Tags by Squirrels

During the second half of September and early October 1951, paper tree-marking tags were stapled to previously smoothed bark surfaces of ponderosa pine and Douglas-fir trees in the Boise Basin Experimental Forest in south central Idaho. Tags were 2 by 2½ inches in dimension, of manila tag stock, substance 125 white paper, and untreated. A model T-5 Bostich stapler was used to attach the tags to all trees 11 inches (d.b.h.) and over on several areas of some 35 acres each.

Mutilation of tags by animals was soon apparent. Examination

[1]Pearce, John. Identifying tooth marks of some northeastern animals on forest vegetation. Transactions of the 3rd N.A. Wildlife Conference. 1938.

and measurement of tooth marks[1] suggested that the red squirrel (*Tamiasciurus hudsonicus richardsoni*) was responsible; they were numerous and active over the area. Claw marks on tagged trees were well-defined, especially on slightly leaning trees, suggesting that the animals were using runways. Placing the tags off these runways had little effect on interference. Partial disfigurement and complete destruction were about equally divided. Parts of tags in large or small pieces were either left where they fell or were removed perhaps for nesting material.

The Whitman National Forest in eastern Oregon, using a corresponding type of tag and the same method of attachment during a period of warm weather, reports a similar instance of interference from squirrels.

Judging from these observations, persons who wish to mark trees to over a short period should determine the efficiency of paper tags treated with repellent or resort to the more common type of nailed aluminum tag. If an effective repellent can be found, paper tags may still offer the advantage of being cheaper to apply.

JAMES D. CURTIS, *Forester, Intermountain Forest and Range Experiment Station, Ogden, Utah*

Timber Insurance

"When a conservative insurance company lends big money to a lumber concern whose principal security is standing timber, and another company writes a policy of fire insurance on the same standing timber—that's news." So says R. T. Titus, editor of *Western Forest Industries Review*, in his December 28, 1951 issue.

The Travelers Insurance Company has loaned $1,750,000 to Southern Oregon Sugar Pine Corporation of Medford. Principal security for the loan is approximately 300,000,000 board feet of timber owned by the lumber firm on 18,000 acres in southern Oregon and northern California, and operating facilities including three sawmills.

Officials of the insurance company at Portland said that this type of loan was "unusual but based on modern timber management methods that make such a loan feasible."

Another remarkable feature of the transaction, reported Herman G. Green, Portland mortgage loan manager for the lending company, was the mortgagee's policy of fire insurance on standing timber, written by Dooly & Co., of Portland. This, it was indicated, may be the first policy of its kind written in the United States.

Mr. Titus continues editorially, "Chalk up another home run for modern forest management, with its improved and improving methods of fire control, insect control, selective cutting, wood utilization, and reforestation."

EMANUEL FRITZ.

Forest-Cover Maps Can Be Made Cheaply and Quickly

Forest-cover maps of reasonable accuracy can be made photographically for counties or groups of counties at very litle cost.

By conventional methods, accurate forest area and forest type maps are costly and time-consuming to prepare. This is especially true where forests occur mainly as irregular, small, and scattered farm woodlands. The forest area and type maps now being made are mainly for regions where the most important volume of timber is located on extensive blocks of forests. Although these may provide for the needs of foresters working with public lands and the industries supplied by these lands, maps are not being prepared for foresters, industry operators, and land-use planners working with small, scattered farm woodlands. These people often want maps to show the general location, pattern, and importance of forests in a county or group of counties. Many counties in the Central States region have as much as 50,000 acres of forest land. Because this forest area is scattered along drainage lines and from farm woodland to farm woodland, it is difficult for many industry operators, and foresters as well, to visualize the importance of the forests available to them. Maps showing only forest cover would help foresters in their day-to-day contacts when discussing much of the data we have on forest area, volumes, and forest types.

Figure 1, showing the forest cover of 16 southern Illinois counties,

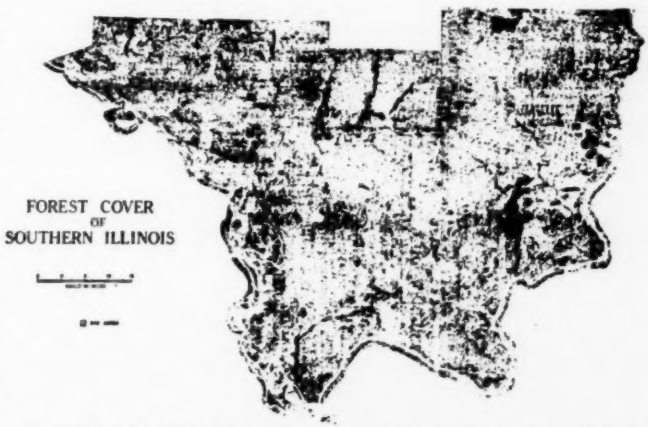

FIG. 1.—The forest cover in 16 counties of southern Illinois. The black areas indicate woodlands.

is a copy of a forest cover map of reasonable accuracy made by a quick and easy method at a very small cost. Forest areas normally show up darker on aerial photos than do other land features. With this in mind, the county aerial photo index sheets supplied by the Production and Marketing Administration were photographed using a contrasty film, and the film was processed to obtain maximum contrast. Enlargements were made from the negatives in order to get all county images to the same scale. Again, contrasty enlarging paper was used to bring out the difference between the black (forest) and white (non-forest) areas. These copies of the index sheets were then made into a mosaic. Figure 1 is a greatly reduced copy of the mosaic which is about 20 by 24 inches.

At the small scale shown here some detail in the picture is lost. Anyone thoroughly familiar with southern Illinois will notice certain areas where a little too much forest is indicated and other areas where not enough is shown. These errors could have been corrected with more time and effort in the darkroom. A few straight, blackline patterns showing up in the picture are an indication of too much forest. These patterns are caused by the black collimating marks on the original aerial photos and by dark shadows resulting from the method of matching the aerial photos used in preparing the county index sheets. These patterns could have been eliminated by painting out the collimating marks and shadows on the county index sheets before they were copied.

Keeping these shortcomings in mind, you still can get a good impression of the general location, pattern, and importance of the forests in southern Illinois. Note that the bottomland forests tend to form solid black lines along the drainages. The upland forests tend to form more irregular patterns and occur more often as small, isolated woodlands.

This project represents about one week's work. Much of this time, however, was spent experimenting with darkroom procedures. This was not an exhaustive study, and the procedures probably could be much improved by someone familiar with photography and darkroom work. If anyone is interested in the details of the procedure I followed, I will be glad to supply the information.

O. KEITH HUTCHISON,
Forest Economist,
Central States Forest Experiment Station.

Comparison of Firm and Medium Mull in Northern Mississippi

The ability of forest soils in northern Mississippi to minimize floods or grow vegetation depends to a large extent on the type of humus mantling them. Recently a comparison was made of the properties of firm and medium mull, two of the principal humus types in the area.

Dry weight of the organic F layer of medium mull was found to be one ton more per acre than that of firm mull. Excess base content of the partially decomposed F layer was significantly greater in medium mull. Medium mull also showed superiority over firm mull in the following properties: pH (5.06 vs. 4.60); exchangeable calcium (6.42 vs. 1.86 milligram equivalents per 100 grams); total porosity (73 vs. 63 percent); depth (2.2 vs. 1.5 inches). Finally, the medium mull had a greater volume of air-filled pores, more available storage space, and an infiltration rate 20 times as rapid as that for firm mull.

Average dry weight of Sudangrass (*Sorghum vulgare* var *sudanense*) grown on the two humus types indicated that the medium mull was better suited to plant growth than the firm mull. Given equal applications of fertilizer and water, Sudangrass grown on the medium mull averaged 41 percent more dry weight per plant than that grown on firm mull. The difference is attributed chiefly to the better root system developed on the medium mull, which supplied more oxygen and offered less mechanical impediment to the roots.

W. M. BROADFOOT,
Southern Forest Experiment Station,
New Orleans, La.

Field Desk for Section Secretaries

Harvey R. Frantz, secretary-treasurer of the Allegheny Section, has found the Army field desk ideal to carry Section files and records to meetings. Its size is 19½" x 19½" x 10½".

Carried like a suitcase it can be set on a table or chair and, when opened, it becomes a desk. There are compartments for books, files, and writing materials and across the top is a drawer for smaller articles. Wherever one opens the desk, there his office is. When necessary the desk may be locked and shipped by express.

SECRETARIES' FIELD DESK

These field desks may be bought from most of the Army and Navy stores for $4.95.

Points of View

American Forest Policy

The book *American Forest Policy a study of Government Administration and Economic Control*[1] is the outcome of an extensive project initiated in 1947 by the Institute of Public Administration of which Dr. Luther Gulick is president. The stated purpose of the project was to find out what happens "when government takes positive action to solve an economic problem." Forestry was selected as a fruitful field for this purpose because, while not typical of all national problems, "it does present an array of administrative experience over a considerable span of years. . ."

In undertaking the study Dr. Gulick wrote: "We will focus our attention particularly on the administrative questions. . . . We will not . . . be able to resolve the basic policy questions . . . nor the technical questions related to forest maintenance and use of timber resources."

Within the framework of the administration of forest policy, Dr. Gulick's conclusions are, with some notable exceptions, stimulating, constructive, and timely. He hits the nail on the head in his emphasis on the responsibility to the public inherent in all land ownership.

It is heartening and timely for him to declare that the public interest in forestry requires positive governmental action including control of cutting practices; that public action has not eliminated private enterprise—in fact, "that even the most extreme forestry regulations proposed . . . would probably enhance the true economic interests of the owner on a long-run basis."

In the present climate of public opinion it is also gratifying for the report to say that extensive public forest land ownership has been a constructive element in American forest policy.

Dr. Gulick pays tribute to the effectiveness of federal leadership in forestry. The report declares that the federal government has furnished the initiative and established essential standards in cooperative programs with the states. "The federal-aid device does encourage the rapid adoption of state programs." The importance of research and the need for a federal research program are also recognized.

The emphasis on the responsibility for policy formation and enforcement, which Dr. Gulick believes the forestry profession now holds, is challenging. Based on what has happened in forestry, he says that "no new governmental program should be undertaken unless, at the same time, a parallel effort is made to recruit and train an appropriate working staff. . . . This may require a personnel program reaching back into the professional schools and the universities."

In Chapter VI, "New Approaches to American Forestry," Dr. Gulick goes "with great diffidence" somewhat beyond his original intent and makes a number of suggestions for solution of the nation's forest problems.

He pleads for considering forestry in the whole fabric of the national economy rather than in any specialized technological context. Toward this end he advocates establishment of a national land and water planning agency in the Office of the President. It is worth noting that he makes no mention of river-basin planning or river-basin authorities but writes only in the context of national programs.

He also pleads for closer cooperation between government and business: "The first step is research to establish the facts of the situation and the current and long-time trends. This research must be free from bias. Then there must be joint discussions leading to mutually agreed definitions of function and policy. The areas of difference should be narrowed by explicit statement. Experience shows that such clarification can be worked out, with the aid of skilled and impartial staffs and chairmen, even where very sharp differences of interests are involved."

Getting down to more specific problems, Dr. Gulick declares "there must be no shadow of a doubt that fire, pest and disease protection in the forest, as in the city, justifies and demands restraints upon private action and the establishment of adequate protective forces."

Also constructive is the timely recommendation for a more active governmental land purchase policy to be developed jointly by the national government and by the states. This would embrace (1) consolidation of existing public forest units, (2) watershed lands when private owners "are unwilling or unable to discharge their responsibilities as thus defined by law," (3) "all natural or potential forest lands which are found to be submarginal from an economic standpoint under private ownership," (4) "The management responsibility of land thus purchased should, as far as possible, be assigned to the local levels."

Although recognizing that "In a few states, reliance of the nation on the state has resulted in a near failure of the [private forestry] programs," Dr. Gulick advocates "vigorous effort to develop effective state forest administration." "Federalism will not long survive unless in each functional area the effort is made to maintain and develop local responsibility and enforcement as far as this is practical." "Where there is time to work toward our solutions, where nation-wide uniformity is not of the essence, where the facts call for extensive divergence and local adaptation, as they do with forestry, it requires no argument to demonstrate that the long-run success of the program itself will require heavy reliance upon the decentralized assignment of responsibility and function."

[1] For a review of this book see the Book Review section of this issue.

Unfortunately in forestry time is of the essence and nation-wide application is important. Fortunately basic national programs do not preclude adaptation to local conditions. For these reasons, those who feel that the nation cannot lightly gamble on its future welfare and security will regret Dr. Gulick's apparent reluctance to call into play the federal leadership to which he elsewhere pays tribute.

Pursuing the philosophy of relying upon the states in his discussion of cutting practice controls, Dr. Gulick confuses the issue in a plea for abandonment of efforts to obtain legal "control designed to produce sustained yield forestry as under the Anderson Bill" (S. 1820, 81st Congress), and by specious reference to the effort of some government foresters "to compel intensive sustained yield management on small farm plots." No government foresters that I know of have advocated sustained yield forestry by compulsion; certainly the Anderson Bill would not require it.

The criteria he gives for successful state forest practice acts seem to conform to the principles on which S. 1820 and the Forest Service proposals are based: "What we need in these forest practice acts is clear standards of delegation, rules which can be and are enforced on a uniform basis, and adequate procedures to protect the rights of the individual." The kind of control set forth in S. 1820 and advocated by the Forest Service is certainly much less drastic than the degree of regulation of loggers and sawmills which Dr. Gulick subsequently recommends to the states: "Commercial operators should, for example, be required to buy stumpage from farmers, etc. under a simple standard contract designed by the state, and subject to local modification only . . . on the basis of defined standards."

Dr. Gulick's apparent belief that successful regulation must have the advance support of the interests to be regulated brushes aside experience in other fields, such as under the Pure Food and Drug Act, the Packers and Stockyards Act, and in regulation of the railroads and public utilities.

In considering various forms of public aid for private forest landowners, Dr. Gulick concludes that the establishment of a forest credit and insurance system is premature. In this as in other technical aspects of the problem, he rejects the opinion of experts. Credit and insurance are tools to facilitate the growing of timber crops. Their use should not be deferred until the timber economy has fully shifted to a crop basis. That would make the shift more difficult. In any event the timber economy is already on a crop basis in major portions of the country, and a beginning has already been made in commercial forest insurance.

It is regrettable that Dr. Gulick did not approach Chapter IV, "Timber Supply and Demand," which above all calls for technical competence, with the same "diffidence" he voices in Chapter VI, "New Approaches to American Forestry." Chapter IV seems to be warped to support a belief that "wood is not a fundamental necessity." The author takes issue with the Forest Service's reappraisal of the forest situation. He marshals resource figures without adequate knowledge of what they mean and without any effort to consider their regional significance or to distinguish between hardwoods and softwoods. In contrast he relies with unquestioning faith on uncritical statistical studies of consumption trends by Dewhurst and Fabricant, neither of whom has any technical competence in the field of forest products. Dr. Gulick's reliance on Dewhurst's forecasts of lumber consumption to discount long-range growth goals suggested by the Forest Service is belied when we note that actual consumption of lumber in 1950 was almost 41 billion board feet rather than the 27 billion forecast by Dewhurst only three years earlier.

Dr. Gulick's tendency to minimize evidence of growing timber shortage also colors the discussions of lumber and stumpage prices. His interpretation of stumpage prices particularly goes astray by failing to take account of differences in timber size, quality, and accessibility.

It is needless to go further into the many technical weaknesses of Dr. Gulick's analysis and interpretation. Had he adequately considered the needs of our growing economy and taken cognizance of the views of competent economists that gross national product may be expected to double by 1975, he could hardly have based his conclusions on the premise of a declining use of forest products. And had he been less ready to assume that professional foresters in public service had a "wooden hobby-horse to ride" or an "axe to grind," he might have tempered somewhat the optimism with which he concludes that fifty years hence "adequacy of the [timber] supply on the North American continent is assured, provided we continue to maintain and extend fire, disease and pest protection for the forests and provided the price of timber offers a real inducement to encourage the growing of trees."

In reading this book one can do no better than to heed the advice of Dr. Gulick himself published in 1937: "*Caveamus Expertum*. . . . Every highly trained technician, particularly in the learned professions, has a profound sense of omniscience and a great desire for complete independence in the service of society. . . . Another trait of the expert is his tendency to assume knowledge and authority in fields in which he has no competence. In this particular . . . [they] are all the same — having achieved technical competence or 'success' in one field, they come to think this competence is a general quality detachable from the field and inherent in themselves. They step without embarrassment into other areas. They do not remember that the robes of authority of one kingdom confer no sovereignty on another; but that there they are merely a masquerade."

EDWARD C. CRAFTS,
Assistant Chief, Forest Service, in Charge of Program Planning.

Comment on "Just What is Conservation?"

The article "Just What is Conservation?" by Emanuel Fritz in the January 1952, JOURNAL OF FORESTRY is a stimulus that arouses many responses.

It seems reasonable that there would be general acceptance of the definition that Conservation is "wise use"; that basically it is "frugality"; that it applies to *all* natural resources and also to the use of time, effort, materials, and money; and that "Conservation should be taught at its roots."

I hesitate to raise a question about anything in an article with which I find myself in such general accord. However, my curiosity has the best of me. With apologies to the author, I should like to present two points.

First, in the author's explanation that conservation applies not only to forests but to all other natural resources, he did not include wildlife resources among the natural resources listed. Why? Also, should not vegetational resources other than forests have been included? Many will argue perhaps rightly that recreation, scenic and historic values of our national parks and monuments and wilderness areas are also natural resources which call for "wise use" within the definition of Conservation. There may be still others.

My second point arises from the statement that if one were to ask 1,000 people at a busy street corner "What is Conservation?", the author's guess would be that 75 percent would answer that it applies to forestry. I wonder if that would not vary in different parts of the country. In a state where hunting and fishing are predominant recreation activities and which has an active state conservation department, is not the answer likely to be that conservation applies to wildlife? And in any agricultural state where the Soil Conservation Service and the agricultural college extension service have become effectively organized, it is hard to believe that the answer would be forestry.

Perhaps the solution is to foster an ever broader concept as to what *are* our natural resources, human as well as physical, together with a conservation education program which involves a careful analysis of "wise use" and the development of necessary skills, attitudes, and appreciations essential to its effective application.

RAY E. BASSETT,
U. S. Forest Service,
Milwaukee, Wis.

Ohio Maple Syrup Bulletin —Further Discussion

The review of *Ohio Maple Syrup —Some Factors Influencing Production*[1] in the December 1951 JOURNAL, by A. C. McIntyre, seems to me unfair and misleading. For the most part, he has mentioned only minor details and left the reader with little conception of the contents of the bulletin. He has minimized the authors' work and leaves the impression that the bulletin is not worth reading.

In the last two paragraphs, Mr. McIntyre discussed openness of the sugar bush and ease of gathering sap. His implication was, since 11 man hours per 100 buckets were required for gathering sap in the grazed sugar bushes and 10 man hours required in the ungrazed sugar bushes, that sap was as easily gathered in ungrazed as in the more open grazed bushes. There were an average of 41 buckets per acre hung in the ungrazed, compared to 26 buckets in the grazed bushes. Another implication might be that, since the buckets were located closer together in the ungrazed bushes, sap gathering was faster in spite of the underbrush.

My own feeling is that a well-rounded review of this bulletin might point out the following statements:

While it is difficult to obtain accurate, comparable information from maple producers, the very large amount of the data obtained did lead to considerable significant information. The bulletin appears to have been written for both scientists and the producers themselves. This has made it difficult for the former to discern all processes and results; in some places, it is doubtless confusing to the producer. Nevertheless, there is much of interest for both.

The bulletin is divided into four sections — factors relating to sap production, cost of production, marketing, and the ideal sugar bush. Of particular interest, are the results found concerning relationships of amount and sweetness of sap with variations in size and condition of the tree crown. Cost of production is related to sweetness of sap, size of enterprise, and number of buckets hung per acre. The ideal sugar bush must combine efficient use of labor, equipment, and land. The authors have shown that large trees which flow sweet sap and an operation of at least 1200 to 1500 buckets are primary requirements for efficient production.

Some specific criticisms may be made. The authors state that direction of exposure did not have much effect on sap yields. Considering a number of sugar bushes over a period of years, this may be true. For any one bush or season, direction of exposure may be very limiting in sap production. A number of graphs are presented showing the relation between volume or sweetness of sap and several variables, including length of crown, diameter of crown, d.b.h., crown density, and growth in rings per inch. There is little attempt to explain cause and effect, and the reader must interpret for himself the relative importance of the several variables.

Many of the facts produced, not all entirely new, are not fully recognized by many people interested in maple sap production. The great amount of data presented may be both convincing and stimulating to all concerned.

ROBERT R. MORROW, JR.,
Cornell University.

[1] Moore, H. R., W. R. Anderson, and R. H. Baker. Ohio maple syrup—some factors influencing production. 53 pp. Illus. Research Bul. 718, Ohio Agricultural Experiment Station, Wooster. 1951.

The Psychological Foundations of Conservational Behavior

Our generation of foresters is witnessing a lopsided development of conservation theory and practice. The biophysical scientists and economists are gradually dominating the field. One may readily succumb to the notion that given enough test tubes, slide rules, and IBM punch cards man can meet and solve the most complicated natural resource problem. The role of culture, and of the individual's personality within that culture, is a topic seldom analyzed—except via the back door of poetry or fiction. Perhaps that is where such non-scientific subjects should be handled, but it is interesting to speculate for a while upon what it is that makes people tick from the standpoint of "conservational" behavior.

In essence conservation involves current sacrificial behavior in the interest of assuring continuity of benefits for future generations. Acts of moderation or restraint are ordinarily placed in the category of altruistic behavior, in contrast with forms of less inhibited conduct which more clearly support an egoistical pattern of living. What more fascinating and useful knowledge could a forester possess, then, than a clear insight into those forces which motivate some individuals to act in a manner favorable to the survival of civilization and its sustaining resource base?

What follows is a descriptive summary covering observations made over the past decade, set forth in lay language, without benefit of supporting details. My purpose is to suggest a working hypothesis, rather than to erect and defend a dogma. I have attempted to avoid folklore (important though it is) and concentrate upon traits actually manifested at one time or another by specific persons or groups. In drawing the profile of the conservational personality I realize that (a) it is probably incomplete, (b) probably no single persons possesses *all* these characteristics, and (c) that these qualities tend to occur in clusters rather than in isolation. There is no particular significance to the sequence in which the factors are listed. The attributes are as follows:

1. A strong sense of that which is functional and of how a function may be fullfilled efficiently. This faculty permits one to penetrate through the multiple encrustations of frivolity, indulgence, and sheer waste which clutter up so many aspects of economic endeavor.

2. Intuitive recognition of the finiteness of the resource-plus-man complex. This rests upon the fact that important boundaries are set by inviolate thermodynamic laws, laws controlling the organization of energy and materials into entropy reversing systems which yield human benefits. Currently it is popular to discredit such persons by dubbing them "Malthusians," this being a convenient way of implying that such a man is an unwarranted pessimist and a bump on the wheel of 20th century progress. However, in the absence of the finite "feel," conservation ideology can hardly be meaningful, except as a psychotic burden lugged about by deluded worry-warts.

3. The power of differentiating between actions which diminish the total resource for the temporary benefit of the few as against those actions which tend to maximize the sustained flow of well distributed benefits over indefinitely long spans of time. This is not the same as believing that there never can be a coincidence of short range individual interest with long range public welfare. Rather, it is the ability to define and detect the kind of behavior which produces this coincidence, or prohibits it.

4. Immunity to sheer quantitative persuasiveness, or the ability not to be over-awed by massiveness alone. This is the anchor which holds one steady against the weather vane swing of popular fads and impetuous mass behavior. At other times it permits the mounting of an assault upon inertia, which is the static phase of cultural conformity. This disrespect for the alleged superiority of numbers is not to be confused with anti-democratic tendencies. There is a subtle but important difference, and this difference expresses itself in creativity and leadership rather than in authoritarian imposition of one's unbridled will upon others.

5. Usually there is a firm respect for what might be called the "freedom not to want." This involves a refusal to stimulate artificially or with premeditation the desires of others by way of increasing their appetite for unobtainable or elusive goals. This conduct stems from an appreciation of the corrosive nature of frustration upon human personality and group harmony. The prelude to aggression is always the generation of discontent or tension through the thwarting of sought-after goals. Another way of describing this trait is to say that such people have discovered that the precarious teeter-totter of supply and demand can be balanced by lightening the consumption (demand) end of the plank as readily as it can be balanced by piling increments of production on the supply end.

6. A realization that cooperative arrangements can reinforce and serve egoistic goals rather than defeat or destroy them; and that extreme individualism tends to deteriorate into a chaotic state which frustrates self and community alike. Coupled with this is a preference for group solutions because such solutions tend to attain ethical levels not consistently reached by the uncoordinated efforts of single persons. This feeling stems from recognition of the fact that conserving something requires concerted responsible behavior. Thus the success of a conservation-oriented group is threatened to the extent that non-conserving individuals continue to operate outside the group in a manner that fails to heed the standards of responsibility established and observed within the group.

7. There is an abhorrence of the exploitation of physical scarcity,

if this scarcity is known to be avoidable—i.e. if it is man-made and man-maintained for the exclusive advantage of the perpetrating minority. The issue here is rational rather than moral, and the resource being conserved is human rather than material.

8. An intense interest in what lies beyond time's horizon, plus the conviction that what the future holds in store depends mainly upon what men do today. Clearly fatalism and conservation concepts cannot long reside side by side in a sound mind. This attitude often expresses itself as a bias toward posterity as against a deference to one's ancestors.

9. There is a strong antipathy toward those types of financial solutions which obligate the as yet unexpended efforts of future generations. This pay-as-you-go philosophy is closely related to the posterity bias described immediately above. There is (according to this view) something inherently immoral about the enslavement of our offspring because of our own indulgent attitudes and our desire to avoid payment in full for current benefits. It may be argued that there is nothing wrong with deferring the incidence of costs via public mortgage arrangements, because subsequent generations reap as many, if not more benefits than we reap. This holds good for those kinds of undertakings that produce genuinely amortizable works having prolonged productive life. It certainly does not hold good where a single generation attempts to wring out a vast windfall from a depletable resource via liquidation harvesting. A too devout faith in the magic of double entry bookkeeping, account classifications, interest rates, etc., can lead one into all sorts of difficulties. It is only through the ritual of fiscal escapism that we manage to fasten millstones about the necks of our grandchildren, who — it should be noted — have neither voice nor vote in the matter. Any device which tends to soften or conceal the immediate and justifiable sacrificial impact of resource conservation measures is, in the long run, anti-conservational. Sooner or later the magic cement of the bookkeepers falls apart under the inexorable and ever mounting pressure of resource reality. Such moments in history have nearly always been catastrophic.

10. Last, but not least, there is a healthy disrespect for panacea, under whatever guise. This scepticism provides armor against the narrow solutions pressed forward by inbred groups of specialists who tend to interpret all problems in the light of their respective techniques. One might call this the sense of unity, or wholes. The unitary outlook is a product of hard won perspective, hence slow in evolving. It is rarely found except in the mature conservational personality, the man who views resources as a vast matrix seen from within, much as the earth bound astronomer gets to know his own stellar system, his galaxy, and his universe.

Some Tentative Conclusions

Compared with the cold, hard facts of the silviculturist or the forest economist, this is tenuous stuff indeed with which to build a verifiable hypothesis that is pertinent to the way men go about conserving their natural resources. Yet it can be asserted that such attitudes, and the behavior they generate, are potentially more influential than is a rigorous understanding of the technical and economic events involved in resource use. The existence of such personality traits in a part of the population suggests that the conservation concept can be more widely diffused than it is today, if only we better understood its psychic sources. This leads me to conclude that the critical conservation frontier today is the psychological one, and that the major retarding forces are those stemming from deficiencies in the science of man, rather than from the science of materials or resources. If the foregoing theory has merit, then it behooves us as foresters to take another look at our professional tools, the educational system under which these tools are acquired, and the emphasis we give our major programs and policies. Such an examination would not result in a junking of what we already have. But it might lead to a gradual shift in emphasis and to a different allocation of funds and manpower than we now consider correct. It might pave the way for modifications of administrative methods and organizational arrangements now considered suitable for coping with integrated resource conservation activities and the forestry facet thereof.

It is too early to predict the specific outcome of a conservation program that concentrates its attack upon the psychological frontier. There is no certainty, and certainly no agreement, that this is *the* frontier. In some quarters its very existence is questioned or else assigned an insignificant role. Perhaps this amateur effort will stimulate some early research projects in the nature of first steps toward the scientific study of the psychological foundations of conservational behavior.

HOWARD E. BALL,
Washington, D. C.

Reviews

American Forest Policy: A Study of Government Administration and Economic Control.

By Luther Halsey Gulick, 252 pp. Duell, Sloan and Pearce, New York. 1951. $3.50.

More and more the people of the United States have been turning to government for the solution of economic as well as political problems. This tendency raises many important questions of philosophy and practice. In the hope of finding a clue to their answers the Institute of Public Administration, of which Luther H. Gulick is president, decided to undertake an intensive study of one of the older and well-established governmental programs, namely, that in forestry. The results are summarized in this informative and challenging book that should be widely read in industrial, governmental, and educational circles.

Dr. Gulick's final conclusion is that "the American forest policy is proving a success in its major outlines." In his judgment there is no danger of a wood famine. It is improbable that we shall ever be seriously short of timber resources for any conceivable emergency. Public ownership and private enterprise have proved to be complementary rather than mutually destructive. Decentralization has gone far in the management of federal lands, particularly in the Forest Service, and has operated successfully fully as much because of the uniformity of professional training and doctrine among the forestry personnel as upon administrative techniques and supervisory red tape—"a point of great significance for administrative theory."

The system of conditional grants-in-aid, he believes has worked remarkably well, although it has failed to assure satisfactory progress in those states which are unable or unwilling to adopt effective programs. It is also a "schizophrenic budget," in which proposed expenditures do not receive adequate review by either federal or state budgeting and appropriating agencies. There has been a transfer of leadership in the development of policies from civic groups, political executives, and legislators to a "cohesive professional bureaucracy." ("Bureaucrat" and "bureaucracy" are used in their scientific meaning, with no opprobrious implication.) This shift in initiative assigns to our elective and politically responsible officials a new role—"that of deciding when and how fast the professional experts and bureaucrats may go in fulfilling their dreams." The problem is to use the expert without abandoning ultimate social control by the common man.

"With great diffidence," Dr. Gulick suggests many "new approaches" for improving the present situation in the woods. Space limits comment to only a few of the more striking and controversial of these proposals.

First and most important is his insistence that "the basis of our thinking, and planning, and acting for forestry must include all our land and water resources. We have approached forestry on too narrow a basis up to now, both in our hearts and in our technology." He therefore recommends the establishment in the office of the President "of a new official planning and co-ordinating agency to deal with the problems of land and water in their entirety." This agency would be headed by a single Land Use and Resource Adviser appointed by the President and assisted by a small staff. Associated with the Adviser would be a Resources Conservation Commission created by Congress, with membership drawn from the industries affected as well as from the public at large. Among the responsibilities of the Adviser and the Commission would be the preparation of a comprehensive Master Land Use and Water Plan, which might some day "be good enough to justify zoning of our total resources by the several states."

Despite Dr. Gulick's assurance that the plan would not be a dogmatic or authoritarian strait jacket, his recommendation is likely to be violently opposed, in spite of its very considerable merit, by those to whom any public planning, particularly at the federal level, is anathema. Strangely enough no consideration is given to the reorganization of the executive branch of the government as a means of promoting the coordination and efficiency of natural-resource management.

Closely connected with planning is the concept of multiple use. While this "is an important feature of good management, a great deal of loose thinking and muddled budgeting goes on in the economic shadows thus introduced into the forest." The author believes it important to differentiate as to the importance of the values involved and suggests the following priorities: (1) timber; (2) water; (3) grazing; (4) wildlife, recreation, and inspiration. In placing the last group "far down the line, in their justification for expenditures and administrative adjustments," he seems to minimize unduly the intangible values of recreation including hunting and fishing and the very large cash expenditures to which their pursuit gives rise.

Dr. Gulick believes that the states are now the major administrative factor of the American forest program in so far as private forestry is concerned. Acceptance of this point of view "will affect the mental attitude of the national forest bureaucracy and congressional leadership, and equally of the state bureaucracy and state political leadership." Most important of all, it will "place the responsibility for action, and for failure to act, where it belongs."

"On this whole problem of federalism," Dr. Gulick states, "the American people lost their sense of direction somewhat as a result of the Great Depression and the two world wars. . . . When state action is weak or slow . . . a plan to super-

sede the states is not solely a forest problem. Such a change is a constitutional amendment of our federal system. . . . Federalism will not long survive unless in each functional area the effort is made to maintain and develop local responsibility and enforcement as far as this is practicable. For forestry, this means a vigorous effort to develop effective state forest administration together with the public opinion required in its support." In line with this view he believes that state, but not federal, control of cutting on private land should be extended gradually.

This conclusion will presumably meet with the approval of the majority of foresters and timberland owners, but provides no remedy when private owners and states fail to meet their responsibilities. Curiously enough, no reference is made to the interstate compact, as exemplified in the Northeastern States Forest Fire Protection Compact, as a device for strengthening the federal character of the nation.

Another interesting proposal is that management of public forests should aim at "sustained yield of high-grade saw timber on a long-run basis, with general cutting of public forests concentrated during periods of special need." Under this policy, which has much to commend it, the government would sell only during periods of heavy demand and high prices and would make a sharply reduced amount available in slack periods. Such action, the author contends, would tend to level off the price peaks and fill in the valleys, and would substitute a positive price policy for the present neutral policy.

Foresters will be gratified at the tribute paid by Dr. Gulick to their professional status. "Because of the forestry educational system established, because of inspired leadership, because of the career system maintained in federal and some state forestry departments, because of the group solidarity and good public relations maintained by foresters, forestry has become a distinct and honored profession in this country. . . . The profession is perhaps too narrow, as Dean Graves and others suggest, and is perhaps still too much under the shadow of German traditions and doctrines, but it is none the less an extraordinarily successful aspect of the American Forestry picture."

The most distinctive feature of the book is that it analyzes problems in forestry programs and progress from the point of view of the public administrator rather than the technician. Whether or not foresters agree with the author's conclusions, they will be impressed by the thoroughness of his analysis and stimulated by his recommendations. To three basic questions they can profitably give special attention: (1) How can the forester's training be broadened to enable him to exercise more effective leadership both in civic affairs and in professional activities? (2) In a mixed economy, what should be the division of responsibility between government and industry, and how can cooperation in joint programs for the attainment of common objectives best be obtained? (3) In a federal union, how should sovereignty be divided between the states and the nation, both in general and with respect to forestry in particular?

The future contribution of our profession to the well-being of the American people will depend largely on the wisdom with which we help to answer these questions. Dr. Gulick has done the profession a real service in bringing them so sharply to our attention.

Samuel T. Dana,
University of Michigan.

Studies on Extensive Dying, Regeneration, and Management of Birch.

By Robley W. Nash and Edward J. Duda, assisted by Norman H. Gray. Bul. 15, Maine Forest Service. August 1951.

The extensive dying of white birch (*Betula papyrifera*) and yellow birch (*B. lutea*) that has taken place in Canada's eastern provinces and in the northeastern United States during the past fifteen years makes this a timely bulletin. Few people outside the regions affected realize the severity of the damage. The authors estimate that in Maine about two-thirds of the birch has been killed, with about 15 percent of the remainder in a dying condition. Mills largely dependent on birch for their raw material have been hard hit by inadequate supplies, inferior quality, and increased prices.

Damage has been worst with old, dominant, mature, and over-mature trees, in stands of low vigor, and on poor sites. Final death, in the judgment of Nash and Duda, is usually due to the bronze birch borer (*Agrilus anxius*). Heretofore this insect has been generally regarded as a weak parasite capable of killing only weakened trees that would soon die anyway. The authors believe that in outbreaks such as the present one it may become a more dangerous threat.

According to their theory, in support of which they adduce considerable evidence, the older stands of birch, in uncut as well as in cut-over areas, have first been weakened by subnormal precipitation. Loss of vigor has then rendered them susceptible to attack by the bronze birch borer, which has so increased in numbers as to enable it by repeated and abundant attacks to overcome trees that might have recovered with the return of normal precipitation. In other words, while the insect may still be regarded as secondary from the point of view of being able to do serious damage only to trees already weakened by some other factor, it may nevertheless be the direct cause of greatly increased mortality when it reaches epidemic proportions as a result of the occurrence over wide areas of conditions unfavorable to the birch.

Airplane spraying with DDT at the rate of two pounds per acre is suggested, not as a cure-all but as an emergency measure (1) to tip the balance in favor of trees that might recover if the insect were eliminated, and (2) to prevent excessive damage in valuable stands until they can be harvested. Far more important in the long run is the adoption of silvicultural practices that will keep birch stands in

a healthy condition. This necessity leads the authors to devote much attention to the difficult problem of managing both birch species so as to maintain adequate supplies in vigorous stands. Recommendations are made for cutting practices with white birch under six different combinations of age, vigor, merchantability, and mixture. Yellow birch, the easier species to manage, receives less space, with emphasis on harvesting at maturity and avoiding full exposure of residual trees left after partial cutting.

The bulletin summarizes the results of more than ten years of study by the Maine Forest Service, with special reference to the causes and control of "birch dieback," and to the management of white birch and yellow birch as important components of the Maine forest. Although it naturally does not say the last word on any of these subjects, it provides much new information based on extensive field work and provides a substantial foundation for further research. It is an important contribution with which every one interested in the management of the two species considered should be familiar.

SAMUEL T. DANA,
University of Michigan.

The Molds and Man: An Introduction to the Fungi.

By Clyde M. Christensen. 244 pp. Illus. University of Minnesota Press, Minneapolis. 1951. $4.

This book should be both informative and entertaining to all. "Molds" as used in the title means all fungi from those growing on bread or damp leather to those in trees or on logs. The author writes as one having an intense personal interest in fungi and as one who has long studied them and taught undergraduate and graduate students. Also, he has taken time to obtain accurate and detailed information about interesting fungus relationships that have been studied by many other workers.

The reviewer has seen no other

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book that tells about the fungi from as broad a viewpoint as does this one. It is an introduction to the subject for those who want only a casual or speaking knowledge of them as well as for the student who plans to obtain a professional knowledge of fungi.

The book covers the following subjects: what fungi are, how they grow, what they do, how they affect us, simple and sometimes ingenious ways of reproduction and spread to places where they can grow and thrive, fungus partnerships with plants and with animals, fungus parasites of plants, microorganisms, insects, fish, land animals, and man, fungi that destroy commercial products and stored food, and fungi that have been exploited in industrial processes. Selected references appear at the end of each of the ten chapters. A classification of the fungi is summarized in the 26-page appendix.

The author is well qualified to discuss the fungi causing diseases of agricultural crop plants. Man has had a continuous struggle to keep ahead of such destructive diseases as grain rusts, smuts, blights, wilts, and seedling diseases. Detailed information is needed on each disease organism, on the different strains, and on how new ones develop to lessen the effect of breeding resistant strains of plants.

Little information is available on the effect of crop diseases on the history of man—the rise and fall of civilizations. As diseases have existed since before man began raising food crops, their effect has probably been an important factor in the wealth and strength of nations.

An important aspect of fungi is their possible effect on the evolution of plants, by their tendency to form cooperative fungus-plant relationships. For instance, what will be the ultimate effect on trees in such arrangements? Dr. Christensen states that cooperative relationships undoubtedly have influenced the evolution, survival, and distribution of many kinds of trees. There is evidence that after such partnerships have been formed they cannot be reversed. He states, "There is a good possibility that in the twilight of this world the forms of life predominating will be the fungi and those plants and animals smart enough to have gone into partnership with them. . . . The independent and individualistic plants and animals may eventually become a dwindling minority, if they are not already." He draws a parallel to man, having gradually given up freedom for greater security.

Throughout the book there are numerous philosophical reflections on the interrelationship of fungi and plants and man, and on the value of research to society. Dr. Christensen states, "The methods and attitudes of research may be one of the most important contributions western civilization has made not just to the general welfare of the world, but to world culture, in the sense of providing an environment more favorable not only to the physical but to the intellectual and spiritual growth of man."

Ross W. Davidson,
U. S. Division of Forest Pathology, P.I.S.A.E.

Plants of Big Bend National Park. By W. B. McDougall and Omer E. Sperry. 209 pp. Illus. U. S. Govt. Print. Office, Washington, D. C. 1951. $1.

Plants of the Big Bend National Park is truly an outstanding publication. It is the fruit of several laborious years of search and study in one of the nation's newest and most picturesque national parks. It would have been a welcome companion when I accompanied one of the authors on a brief visit to the park during the summer of 1951.

The park, lying in a huge U-shaped bend of the Rio Grande River, possesses within its 707,895 acres a vegetation representing both the Southwestern United States and the Republic of Mexico. The authors, both of whom have a broad and intensive background in this field of study, offer a brief description of the four general types of plant communities found in the park. These present a wide floristic variety to the visitor, ranging from the extensive desert scrub of the lower elevations to the ponderosa pine-douglas fir-Arizona cypress forest type of the higher elevations in the Chisos Mountains. The cacti of the desert scrub type display an unbelievable beauty in a birlliant floral display during late spring. During rainy seasons the desert is often covered with flowers of varying hues produced by short-lived annuals. For the beginner a short discussion regarding plant structures and the use of botanical keys is included. In order to explain botanical terms, which have been used only of necessity, the authors have included a two-page glossary.

The principal portion of the book is devoted to descriptions of more than 800 species of plants. All vegetative forms are included from the spore-bearing ferns and mosses to trees of the mountain forests. Nearly a score of outstanding specialists assisted in the work with the various plant families and genera. The publication is respendent with 190 illustrations which enhance the book's attractiveness and utility. All of the principal species or groups of species are illustrated with strikingly detailed photographs. Simplified keys enable the student of nature to identify the plant in hand as to family, genus, and species. Under species descriptions the authors have indicated plants which are of forage value to livestock.

Although the publication is presented in language comprehensible to the occasional visitor, it also fills the need of the scientist whether he be botanist, biologist, ecologist, forester, or range manager.

Robert R. Rhodes,
A & M College of Texas.

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Compiled by MARTHA MEELIG, *Librarian, The New York State College of Forestry*

Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

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Shall We "Popularize" Elections to the Grade of Fellow?

When the membership in the Society was about one-tenth of that of today, and only the Senior Members had the ballot, elections to the one honorary grade, that of Fellow, was by vote of the members. For election, a candidate had to receive a two-thirds vote.

With the expansion of membership to over 4000, the admission of Junior Member to full voting privileges (something that the engineering societies never did and never would do), and the consequent loss of contact between members, this system completely broke down, for the simple reason that practically no candidates ever received the requisite number of favorable ballots. Now, with these conditions still further accentuated, what hope is there that a different result could be expected, unless the standards were lowered and elections placed on the basis of majority approval by those voting, or on the assumption that anyone nominated by the requisite 25 signers to a petition should be elected without further question?

Under recent amendments to the constitution and bylaws, the advancement to the grade of Member (formerly Senior Member) has been reduced to an office routine. Shall we now extend the "democratic" process to Fellows, and leave it up to the 8000 voting members to decide by popular ballot who shall be selected for this honor?

The same difficulties, dissatisfactions, and confusion, worse if anything, plagued the Society in the matter of advancement to Senior Membership. This grade had been placed on the basis of "achievement" and no two sections ever agreed on the standards required. When "achievement" was dropped and "competence" substituted, a practicable and workable basis was obtained, especially after the word "Member" was substituted for "Senior Member." Again we had the precedent of the engineering societies with fifty years longer experience for making this change. Members are now all in one "democratic" rank and are not separated into sheep and goats on any vague and ill-defined standard of achievement.

When it comes to selecting men for the only honorary grade we have, that of Fellow, it is somewhat different from electing a President and Council. For President, the choice goes to those best known, and presumably best qualified, in the minds of all the voters, including the host of Junior Members who have not yet had time to demonstrate competence or serve three years in the profession.

The requirements for Fellows are "foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character," and in Bylaw 8, the prescribed eligibility requirements for Fellow indicate that a candidate's record and reputation should be well known among Members and Fellows (not Junior Members) who alone are entitled to vote for these candidates (an anachronism, not yet corrected). Such candidates should be selected from among the most widely known Members, whose professional service has been exceptionally outstanding. In Article III, Sec. 6, it also says, "Fellows shall be engaged in forestry work at the time of their election." (Another anachronism as many candidates are already retired!)

After the system of popular election by the votes of all members had proved its complete futility, and following two successive carefully considered constitutional amendments passed by referendum vote of all Juniors and Members, the responsibility for the election of Fellows was vested in a Board of Election composed of surviving Fellows and the members of the current Council. For the 1951 election there were 55 Fellows who with the Council of 11 made a Board of Election of 66 men, not counting possible duplications of Fellows serving on the Council, if any. This Board does not select the names of candidates, which is done by petition. This means that anyone who is considered worthy of nomination by 25 members will be balloted on by the Board. Is this process "undemocratic?" Would it be more democratic if nominations were considered tantamount to election, and the Board was in honor bound to elect everyone so nominated, or if the Board ignored petitions and made their own selections? Then why not turn over the selection of Nobel Prize winners to the popular vote of all qualified scientists, with similar "democratic" processes for other honors?

How much chance is there in a Board constituted as ours is, of favoritism or group preferences? The list of "electors" appears in the July 1951 issue of the JOURNAL, page 340. Look it over.

On the other hand, election by popular ballot, aside from having been demonstrated as unworkable, is fraught with dangers that can be avoided if the responsibility is placed on a Board of Fellows and Council members. Is the mere holding of a prominent office sufficient reason for election to this honorary grade? Supposing for the sake of argument that a candidate of considerable prominence professionally has in his record discreditable and unethical incidents that are not popularly known. How can such a case be handled in a popular vote, short of bringing charges of unethical conduct? And how are men who have contributed superlative work in research or other lines, but who are not well known outside the locality or section in which they reside, be blown up to catch the vote of the 8,000 electors, in a 200-word statement which is all that can be permitted to describe their merits? One such man, from Pennsylvania, was nominated three times before even the small body of Fellows was able to get the proper line on him. Should pique at failure to secure election of all candidates on the first ballot be a reason for throwing the choice to the "people"?

"Democracy" is a leveling process. Must this be the method of choosing those who merit the honor of the grade of Fellow? If so, why not abolish the grade? Then there would be no more crabbing about

favoritism and undemocratic methods of awarding honors in our Society.

Personally, I believe that our present system, evolved from experience, is sound and workable, and should be continued as it is.

H. H. CHAPMAN.

Are Natural Areas Essential?

The Society has had a Committee on Natural Areas since February 1947. Its first formal report was presented at the Society's annual meeting in 1948.[1] This constitutes the second report.

The Committee feels that considerable progress may be reported toward attaining the goal set forth in the first part of the Society's definition of a natural area, namely, "An area set aside to preserve permanently in unmodified condition a representative unit of the virgin growth of a major forest type. . . ." However, the latter half of the definition which states ". . . primarily for the purposes of science, research, and education," and which is the reason for natural areas, is far from being carried out.

We appear to be faced with the question "Are natural areas essential?" Ashe[2] in 1922 stated:

. . . The outlook is that in a few years all of our forest lands not specifically reserved will have been cut over. Only the vestiges of the forest primeval set aside for definite purposes will be left. . . . It is eminently undesirable that the development of American silviculture should be hampered by such a lack.

Before it is too late, areas of each forest type should be set aside, . . . and situated if not where least accessible at least where there is little incentive for mercenary exploitation. The setting aside of such vestigial units will assure that the normal forest associations, once standardized, can be carefully studied and employed for future reference and guidance. It will be possible to maintain in such reference units the autochthonous biota in its elementary purity, except as affected by internal or natural agencies. . . . Their aid in determining the life history of the different forest associations which they represent and their value as guides in bettering the treatment of the remainder of the forest will far more than offset the possible loss in timber.

In a few years these units will afford the only remnants of the primitive forests and as check plots will preserve for the forester the data from which he has worked and to which he must refer continually for guidance in maintaining the balance between species. This in large measure will determine the successful management of the forests.

The National Forest Reservation Commission in its fiscal year 1929 report to the Congress included among the objectives of the forest land acquisition program:

. . . (3) Promotion of reforestation and timber production on forest lands other than those whose acquisition is contemplated, by creating means for—

(a) Development of the principles and practices of silvicultural management necessary for successful timber growing in the various forest regions and forest types and on the various forest soils of the country.

The report indicates that one of the Commission's important actions was the approval for purchase of a virgin stand of white pine and hemlock known as "Heart's Content" located in Warren County, Pennsylvania. The Commission stated:

. . . Notwithstanding the high commercial value of the heavy stand of white pine timber, it is deemed eminently desirable that the Government should acquire this property, not as a museum site or as a recreational tract but as a laboratory for the promotion of silviculture within which to study both the physical and biological aspects of the changes which take place in such forests, the concomitant changes in the white pine-hemlock forest type, and the manner in which knowledge of these changes may be of value in guiding the development and management of the several hundred thousand acres of cut-over white pine lands eventually to be acquired as the larger part of the Allegheny National Forest.

Romell[3] in commenting upon the action of the Commission said:

. . . The fact that the purchase was consummated seems to show that the indispensability of natural areas for forestry and research promoting forestry has been fully realized, and forms a very valuable and promising precedent. . . . It is to be hoped, therefore, that the Government can be relied upon in the future to acquire other much needed sample areas of natural forest types, in case they cannot be found within the National Forests.

Furthermore, Forbes[4] in commenting on the two statements of the National Forest Reservation Commission quoted above said:

These extremely significant statements lend hope to those who have sighed over the lack of virgin areas suitable for Research Reserves within the present boundaries of the eastern National Forests, and have wished that the few pitiful remnants of orignial growth still in private hands but within the exterior boundaries of the purchase units might yet be acquired for scientific study.

Finally, Hough[5] in reporting on the action of the Forest Service in setting aside the Tionesta Natural Area in Pennsylvania said with respect to this virgin hemlock type:

. . . This area is admirably suited for studying the development of the climax type, the natural rejuvenation that results in the perpetuation of the climax, and the response of the climax forest to climatic and biologic cycles. It is equally valuable for studying how completely the virgin forest supplies the life needs of the various animals found therein, and of how the forest with its multitude of different plant and animal forms influences the local climate, the soil, and the regimen of streams.

. . . It is the desire of the Forest Service that this area be used to the fullest possible extent as a center for research in ecology. Colleges, universities, and other educational and research institutions are invited to participate in uncovering the wealth of scientific information hidden within the depths of this virgin tract.

As attested by the foregoing references there has been for over a quarter of a century a reported need for natural areas for research work in silviculture. The Committee agrees that natural areas are essential for research and educational purposes. It offers encouragement to all scientific organizations concerned with flora to use these areas. It suggests for the consideration of the Division of Silviculture the following types of uses to which the natural areas are adaptable and for which, in the opinion of your Committee, they are most valuable.

1. *Research control.*—Natural areas or segments thereof are the finest control areas or examples with which to contrast or relate forest management practices or silvicultural techniques. We do not advocate that natural areas are the ultimate objective for our management planning. Natural areas represent an ecological complex and not a degree of perfection in a

[1] Jour. Forestry. 47: 137-146. 1949.

[2] Ashe, W. W. Jour. Forestry. 20: 281-283. 1922.

[3] Romell, L. G. Jour. Forestry. 27: 592. 1929.

[4] Forbes, R. D. Jour. Forestry. 28: 575. 1930.

[5] Hough, A. F. Ecology. 22: 85-86, 1941.

series of plant successions. As practicing foresters we are often concerned with only a few commercial species in a given type. Should we discriminate against other species found in that same type? Possibly our practices are faulty. Check plots maintained on natural areas should provide at least one set of scientific controls. We, as practicing foresters, will require more of such check plots established on a permanent basis.

2. *Forest soils.*—The growth and reproduction within a managed forest may be better understood if related to the natural growth and reproduction within a true virgin sample of the timber type under management. In both instances, a knowledge of soils is mandatory as well as knowledge of forest soil suitability or productivity which is related so intimately to the biological nature of forest cover, its sociological structure and the complex relationship that exists between trees and their environment.

3. *Tree sociability.*—The factor of tree sociability needs clarification. The distance trees are apart determines height and diameter growth, size of crowns, form of stem, and most important of all to a forester, the quality of the wood produced. Reproduction from trees in the open as contrasted to reproduction from trees in a forest is subjected to considerable variance as in the first case reproduction is exposed to fluctuating climatic factors whereas in the latter case reproduction is protected by a closed canopy. Trees in the open live an abnormal life because the natural influence of neighboring trees is not present. Nature's processes provide the living example of the axiom "Survival of the Fittest," and through the extremely heavy mortality rate nature eliminates the weak. As related to artificial planting, seedlings planted too far apart will not produce a true forest. Tree planting that disregards the social aspects of a true forest tend to bring about a general degradation of the stand, as well as degeneration of the future forest which may originate from inferior trees.

4. *Species cooperation.*—Another factor available for comparative study by utilizing natural areas is that of species cooperation. In some respects this is opposed to tree sociability. A species may be necessary to stimulate the growth of another species. The planting of white birch to encourage the growth of spruce seedlings may be cited. Of equal importance is the combination of pine and an understory of beech, oak or hornbeam, yellow birch, basswood, and a number of other species that never occur in extensive pure stands but appear to be dependent upon hard maple or oaks. Optimum development of white spruce takes place apparently only in association with tolerant hardwoods which provide shade and fertilizing litter. The factor of species cooperation may be thoroughly studied within samples of nature's perfect associations of which the natural areas should constitute the best.

5. *Outdoor museum masterpieces.*—Natural areas or segments thereof are in effect outdoor museum masterpieces available for the information and education of individuals and groups. These educational values should increase over the years. Protection of types may in time become the means of protecting a single species which might otherwise be lost. Protection of a seed source of all known timber types would be one value which in time might equal the effort of setting aside natural areas.

6. *Maximum size and age of tree species.*—On natural areas we can learn the maximum size and age that various tree species attain; the changes in tolerance, seeding habits, sprouting ability, and susceptibility to diseases that come with advancing age; and the eventual causes of death. Even though data on these extremes may not be directly useful, they will furnish end points of curves and in that way help greatly to strengthen information about trees of average sizes and ages found in managed stands. Similarly, natural areas furnish extremes for mensurational studies: ultimate tree volumes, both gross and net, and the yield, cull, and growth rates of stands of great age; and for ecological studies they exhibit an accumulation of results from prolonged interaction of trees on each other and of stands on soil and above-ground environment. Old stands, just because they have existed such a long time, will have withstood even the uncommonest catastrophies of weather. Natural areas may thus show that such things as hurricanes and severe glaze storms must be considered in the choice of species to be favored in the long range silviculture of a region, even though they have never been experienced by many stands now merchantable.

7. *Forest development uninfluenced by man.*—Because natural areas have not been cut we can learn from them what forests on similar sites will tend toward if left uncut as they might be in national parks or watershed protection zones, or if managed under a light selection cutting system of silviculture. Although natural areas are not necessarily climax forests, they represent stages in development beyond any shown in second-growth stands and we can learn from them what the natural trend is and can decide whether we wish, by our treatments, to speed it up or to delay it. Compared to managed stands on similar sites, natural areas can tell us what we are losing or gaining in yield of useful products—now, and in the future as foretold by soil changes—by straying away from the natural development of forest stands.

8. *Ecology.*—Natural areas or segments thereof are laboratory examples of the interrelationships of flora, fauna, soil, and water, as found within virgin timber types. How may we measure the changes in plant ecology if we do not have a natural measuring device with which to make the essential comparisons? The natural areas or a sample plot within might well be utilized for such purposes. Although the Committee has constantly emphasized that the basis for setting aside natural areas is directly related to virgin forest types, it has recognized that consideration must of pure necessity be given to

the related faunal influences. True ecological consideration should embrace the relationship between the faunal components, tree diseases, and forest insects, as well as reproduction, a complete knowledge of which is important in establishing management yardsticks.

In the words of Shantz[6] expressed in an editorial in 1950:

> Everything in nature is linked together and every factor or organism, no matter how feeble, affects some other factors or organisms. It does not follow that factors or organisms are equally effective. The connection between them may be direct and important or very indirect and relatively unimportant. In ecology the concept of the community is an exceedingly broad one and can be grasped in detail only by a method of synthesizing the facts developed by analysis. Synthesis requires an intellect backed by broad training and experience if it is to grasp the significance of the details to the whole.

In the opinion of your Committee, natural areas constitute one type of area within which it is possible for the trained forester to study how nature operates.

COMMITTEE ON NATURAL AREAS
JESSE H. BUELL,
RICHARD E. GRIFFITH,
JOHN F. SHANKLIN, *Chairman*.
November 14, 1950

[6]Shantz, H. L. Jour. Forestry. 48: 673. 1950.

Meeting of the Council of the American Association for the Advancement of Science

As representative of the Society of American Foresters I attended the two meetings of the Council of the American Association for the Advancement of Science held December 27, and December 29, 1951 in Philadelphia. Dr. E. U. Condon was elected president of the association; Dr. Lincoln Constance of Stanford University, vice president of Section (G) Botanical Sciences; Charles E. Kellogg of the Bureau of Plant Industry was elected chairman of Section (O) Agriculture to which forestry is attached. Dean John R. Dunning, Lawrence Snyder, and Mark Ingraham were elected to the Executive Committee of the Council.

The Council spent considerable time reviewing the Arden House Conference proposals for gradual shift of emphasis in the main activities of the American Association for the Advancement of Science. The change involves the following four features.

1. The strengthening of the direct usefulness of the AAAS to scientists and to scientific societies. The proposal here has in mind that the American Association for the Advancement of Science is the only one agency in the United States that embraces all science and scientific societies and that therefore is in a position to represent the opinion of scientists as a body.

2. A shift in emphasis from the more detailed aspects of the various technical branches of science to the broader problems of science as a whole.

3. The cultivation of synthesizing and unifying activities as the main emphasis of the AAAS in its internal work within the body of science.

4. Efforts to improve public understanding of science as the main external emphasis of the AAAS.

After appropriate discussion in which both the advantages and some of the difficulties of carrying the proposals into action were emphasized, the Council voted to accept in principle the Arden House statement as a guide in the formulation of future policy. The Council also voted that the chairman of the Executive Committee be authorized to appoint an overall committee and subcommittee to make specific recommendations on future programs.

The Council passed a resolution calling attention to the restrictions to free interchange of knowledge among friendly nations including the limitation of travel abroad. They urged that administrative procedures under the McCarran Act be reviewed and modified so as to minimize injustices and increase our internal strength and our prestige abroad. The Council also urged revising and improving portions of the act to retain the objectives of security but with adequate provision to maintain free interchange of knowledge that has no security implications.

The next meeting of the AAAS is scheduled for Saint Louis, December 26-31, 1952; and the following meeting is to be in Boston in December 1953. Tentative plans have been made for scheduling a a meeting in San Francisco in December 1954 and in Chicago in 1955. New York City is favored for 1956.

HARDY L. SHIRLEY.

Progress Report Committee on Natural Areas

The Committee on Natural Areas in its first formal report, which was presented to the Society at Boston in December 1948, presented two procedural problems for resolution by the Council, namely, (1) That the committee be reduced in size from 6 to 3 members, all of whom should be located within one city or locality, and (2) That the committee was uncertain as to whether it should be attached to the Division of Silviculture or continued as a Society-wide committee. The Council formally approved the reduction in size of the committee on May 13, 1949, and assigned it to the Division of Silviculture on June 22, 1949.

As reported in 1948, the committee found in qualified natural areas 66 of the 147 cover types recognized by the Society. Subsequently, one additional natural area has been found qualified, namely, "The Warren Woods Natural Area" in Berrien County, Michigan, administered by the Michigan Department of Conservation. This area, 196 acres in extent, protects S.A.F. Type No. 57 Beech-Sugar Maple. However, this does not add a new type to our list as Type No. 57 had previously been reported in a natural area located in Orange County, Indiana.

The committee is current with its correspondence. With respect to certain matters indicated as unresolved in the 1948 report, the following is the latest development:

(1) The names for natural areas

within national wildlife refuges which were previously listed as temporary have now been confirmed as permanent names.

(2) The U. S. Forest Service assures the Committee that four natural areas will be organized within the national forests of Alaska.

(3) The Bureau of Land Management has advised the committee that authority exists under the act of June 25, 1910 (36 Stat. 847), as amended by the act of August 24, 1912 (39 Stat. 497), to reserve public domain land in Alaska for the purposes of science, research, and education. The regional administrator in Alaska has been requested to submit recommendations with regard to natural areas.

(4) The committee has considered the recommendation made by the original committee with respect to the National Park Service. The committee recognizes that within the research reserves of the national parks, as well as within the wilderness areas of the national forests, there are virgin plant associations which could be labeled natural areas if the administering agency so desired. In the absence of any such expressed desire, the committee simply reports that virgin type associations, which are available for scientific research projects, may be found within both classes of areas. However, these areas will not be listed at this time as natural areas by the committee.

The Ecologist's Union has originated a development which may have a very definite bearing on the Society's effort to preserve virgin type associations as natural areas. In December of 1949 the Committee on the Study of Plant and Animal Communities of the Ecologist's Union submitted a tentative proposal that the two organizations sponsor a field inspection of nature sanctuaries and natural areas to evaluate such areas more accurately. Your committee replied that the Society was interested in cooperating with the Ecologist's Union but gave two reasons for not joining at this time, namely, (1) lack of finances and (2) your committee felt that our standards by which areas might be evaluated were not yet complete.

Subsequently, the Ecologist's Union sponsored H. R. 8513, a bill "to facilitate the conservation of natural features by providing a Nature Conservancy of the United States." Your committee feels that although the objectives of this bill are highly laudable, certain sections of the bill appear to present possibility for future conflicts between the Society of American Foresters and the Nature Conservancy. Sec. 6 of the bill provides that the Nature Conservancy shall maintain a register of nature reserves that it deems to be of national significance. If the bill becomes a law the Society should make sure that its ideas about natural areas are given consideration by the Nature Conservancy. Since the president of the National Academy of Sciences is to be a member of the Board of Trustees, the Society will have an avenue of approach through its representative on the National Research Council.

Projecting our thoughts into the future, your committee is faced with two major objectives, namely:

(1) How to obtain the balance of the virgin type associations not now located within a recognized natural area?

(2) How to obtain proper scientific use of these natural areas?

The latter objective is discussed in a separate paper entitled "Are Natural Areas Essential." With respect to the first objective, your committee intends to take action along three main avenues, namely:

(1) Schedule in order of priority the types not now represented in Natural Areas. This schedule is now being compiled by the committee.

(2) Encourage the land managing bureaus of the federal government to emphasize in their programs of setting aside natural areas the need to encompass the highest priority types shown in the schedule prepared under (1).

(3) Request assistance of the Society sections in obtaining natural areas on non-federal lands throughout the country. In this endeavor, your committee feels that it should be authorized to seek the assistance of members of the Division of Silviculture located in each section.

Committee on Natural Areas,
JESSE H. BUELL,
RICHARD E. GRIFFITH,
JOHN F. SHANKLIN, *Chairman.*
November 14, 1950

Candidates for Membership

Candidates for admission (except those for the Student Member grade), advancement, or reinstatement whose membership applications were received in the Society office during the month of January are listed below.

Action regarding the eligibility of these candidates will be taken by the Council as of April 1, 1952. Any communications from voting members relating to the membership eligibility of any of these candidates should be received in the Society office prior to that date.

The names of these candidates who become members of the grade for which they have applied will be published in subsequent issues of the JOURNAL OF FORESTRY.

Allegheny Section

Junior Grade

Nielsen, H. K., 1730 W. Fourth St., Dunellen, N. J.; Mich. State, B.S.F., 1951. (Student, 1951).

Norris, T. L., Asst. Dist. Forester, W. Va. Cons. Comm., Romney, W. Va.; W. Va. Univ., B.S.F., 1949.

Varner, D. R., R.R. No. 3, Waynesburg, Pa.; Pa. State, B.S.F., 1952.

Warder, B. J., County Forester, W. Va. Cons. Comm., Martinsburg, W. Va.; W. Va. Univ., B.S.F., 1950.

Appalachian Section

Junior Grade

Lamb, G. E., 200 Brooks Ave., Raleigh, N. C.; N. C. State, B.S.F., 1952. (Student, 1951).

Phillips, J. H., Jr., Forestry Ext. Specialist, N. C. Agric. Ext. Service, Nashville, N. C.; N. C. State, B.S.F., 1950.

Williams, W. D., Forester, Int. Paper Co., Georgetown, S. C.; Duke Univ., M.F., 1951.

Central Rocky Mountain Section

Junior Grade

Julian, R. W., Flandreau, S. D.; Mont. State, B.S.F., 1951.

Pritchard, D. R., Jr., 808 S. Clarkson St., Denver, Colo.; Colo. A & M., B.S.F., 1951.

Seneff, G. A., U. S. Navy; Colo. A & M., B.S.F., 1949.

Tromsness, H. I., Woods Supt., Western Wood Preserving, Inc., Denver, Colo.; Colo. A & M., B.S.F., 1949.

Central States Section

Junior Grade

Aldon, E., 432 Hayden House, Univ. of Mich., Ann Arbor, Mich.; Univ. of Mich., B.S.F., 1952. (Student, 1951).

Barnes, B. V., 1103 E. Washington St., Ann Arbor, Mich.; Univ. of Mich., B.S.F., 1952. (Student, 1951).

Benham, J. G., 334 S. Grant St., W. Lafayette, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).

Borden, T. B., 329 Lawn St., W. Lafayette, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).

Bulgrin, E. H., 1420 Washington Heights, Ann Arbor, Mich.; Univ. of Mich., B.S.F., 1952. (Student, 1951).

Campbell, R. L., 330 Woodlawn, Cambridge, Ohio; Mich. State, B.S.F., 1952. (Student, 1951).

Crabb, J. N., 3730 Park Ave., Indianapolis, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).

Croxton, R. J., 142 Sheetz St., W. Lafayette, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).

Drummond, W. F., Engr. Asst., Indianapolis Water Co., Indianapolis, Ind.; Purdue Univ., B.S.F., 1951.

Freeman, F. W., Asst. Rgr., Ohio Div. of Forestry, Logan, Ohio; Mich. State, B.S.F., 1949; M.F., 1951.

Garrett, H. R., 1505 W. Moor Ave., Columbus 4, Ohio; N. C. State, B.S.F., 1952. (Student, 1951).

Heazlit, C. E., Farm Forester, Ohio Div. of

Forestry, Chillicothe, Ohio; Univ. of Mich., B.S.F., 1949.
Kuhne, E. R., President, Forestry Associates, Inc., Hart, Mich.; Univ. of Mich., B.S., (Biol. Sciences), 1935; M.S.F., 1936).
Meso, S. W., 222 Marsteller St., W. Lafayette, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).
Nordli, R. C., 31 Chevy Lane Heights, W. Lafayette, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).
Ober, M. G., 429 W. Wood St., W. Lafayette, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).
Pickerl, L. C., Purdue Univ., W. Lafayette, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).
Pruett, E. W., 21 N. Lafayette St., Oolitic, Ind.; Purdue Univ., B.S.F., 1952. (Student, 1951).
Scher, T. G., 5495 Dorchester Ave., Chicago, Ill.; Univ. of Mich., B.S.F., 1952. (Student 1951).

Member Grade

Martilla, U. M., Forester, U.S.F.S., Cadillac, Mich.; Univ. of Minn., B.S.F., 1927. Reinstatement.

Columbia River Section

Junior Grade

Betts, J. W., Tree Culture Foreman, U.S.F.S., Bend, Oreg.; Univ. of Idaho, B.S.F., 1950.
Clark, J. W., Forest Pathologist, U.S.D.A., Portland, Oreg.; Baylor Univ., A.B., 1941; Univ. of Wash., M.S.F., 1947.
Duncan, J. D., c/o U.S.F.S., Tiller, Oreg.; Oregon State, B.S.F., 1952. (Student, 1951).
Engstrom, W. H., Research Asst., Oregon State Board of Forestry, Salem, Oreg.; Iowa State, B.S.F., 1943.
Gruba, A. G., Tech. Asst., Oregon State Board of Forestry, Salem, Oreg.; Univ. of Minn., B.S.F., 1950.
Hartman, G. B., Jr., Asst. Forester, c/o Edward Hines Lbr. Co., Hines, Oreg.; Iowa State, B.S.F., 1948.
Hohenhaus, R. A., Box 261, Corvallis, Oreg.; Oregon State, B.S.F., 1952. (Student, 1951).
Madison, W., Jr., Cruiser, Hercules Powder Co., Klamath Falls, Oreg.; Colo. A & M., B.S.F., 1950.
Romero, E., Forester, U.S.F.S., Deschutes National Forest, Bend, Oreg.; Colo. A & M., B.S.F., 1950.
Mitchell, H. W., Mapleton, Oreg.; Oregon State, B.S.F., 1952. (Student, 1951).
Smith, W. A., 442 N. 4th St., Corvallis, Oreg.; Oregon State, B.S.F., 1952. (Student, 1951).
Sullivan, R. C., 327 N. 14th St., Corvallis, Oreg.; Oregon State, B.S.F., 1952. (Student, 1951).
Tomaschesk, J. D., Jr. Engr., Fir Mfg. Co., Myrtle Creek, Oreg.; Iowa State, B.S.F., 1951.

Member Grade

Folsom, F. B., Asst. Regional Forester, U.S.F.S., Portland, Oreg. Reinstatement.
Ruth, R. H., Forester, Pacific N. W. Forest Exp. Sta., Portland, Oreg.; Oregon State, B.S.F., 1943; M.F., 1950. (Junior, 1945).

Affiliate Grade

Harter, L. R., Cons. Supv., Oregon State Board of Forestry, Salem, Oreg.
Ramer, R. J., Supv. Forester, Hercules Powder Co., Klamath Falls, Oreg.; Univ. of Calif., A.B., 1926.
Sandor, J. A., Forester, Pac. N. W. Forest and Range Exp. Sta., Portland, Oreg.; State College of Wash., B.S., (Forestry), 1950.

Gulf States Section

Junior Grade

Bossier, C. A., Jr., Forester, Kirby Lbr. Corp., Houston, Texas; La. State, B.S.F., 1951.
Kohlman, N. C., Plant Specialist, Sears Roebuck and Co., New Orleans, La.; La. State, B.S.F., 1942. Reinstatement.
Lambert, H. R., Dist. Forester, La. Forestry Comm., West Monroe, La.; La. State, B.S.F., 1949.

Member Grade

McConnell, W. V., Asst. Tbr. Mgmt., U.S.F.S., Lufkin, Texas; Pa. State, B.S.F., 1943. Reinstatement.

Affiliate Grade

Burks, L. L., Asst. Forester, Urania Lbr. Co., Ltd., Urania, La.; L.P.I., B.S., (Forestry), 1950.
Keck, W. G., Forester and Land Mgr., F. W. Reimers and Schneider Lbr. Co., Hammond, La.
Wilson, E., Forester, Southwestern Settlement and Dev. Corp., Jasper, Texas; L.P.I., B.S., (Forestry, 1948).

Kentucky-Tennessee Section

Affiliate Grade

Amrhein, G. C., 16 Riggs Ave., Erlanger, Ky.; Purdue, B.S.F., 1952. (Student 1951)
Garner, R. D., Murfreesboro, Tenn.; Univ. of Minn., B.S.F., 1951. (Student, 1951).
Morrett, C. M., 318 High St., Somerset, Ky.; Purdue Univ., B.S.F., 1951. (Student, 1951).

Member Grade

Oren, E. A., S.C.S., Lexington, Ky.; Mont. State, B.S.F., 1931. Reinstatement.

New England Section

Junior Grade

Curtis, R. O., Research Forester, N. E. Forest Exp. Sta., Upper Darby, Pa.; Yale, B.S., (Plant Science), 1950; M.F., 1951.
Dinneen, W. R., Farm Forester, Maine Forest Service, Bridgton, Me.; Univ. of Me., B.S.F., 1937.
Greer, A. M., Jr., Univ. of Mass., Amherst, Mass.; Univ. of Mass., B.S.F., 1952. (Student, 1951).
Mergen, F., Yale Univ., New Haven, Conn.; Univ. of N. B., B.S., (Forestry), 1950; Yale, M.F., 1951.
Parsons, J. W., 20 Avalon Place, Wethersfield, Conn.; Univ. of Maine, B.S.F., 1950.

Member Grade

Goodhue, S., Dist. Chief, N.H. Forestry Div., Lincoln, N. H., Mich. State, B.S.F., 1933. (Junior 35R52).

Affiliate Grade

Lucy, A. K., Asst. Mgr., Conway Supply Co., Conway, N. H.; Univ. of N. H., B.S., (Forestry), 1943.
Rivard, J. F., Div. Chief Forester, Canadian International Paper Co., Trois Rivieres, Quebec, Canada; Laval Univ., F.E., 1933.

Northern California Section

Junior Grade

Cross, A. H., Box 317, Portola, Calif.; Univ. of Calif., B.S.F., 1950.
Dougherty, R. H., Asst. Forestry Dept., Shasta Forests Co., Redding, Calif.; Oregon State, B.S.F., 1941.
Draves, E. E., Forester, Calif. Forest and Range Exp. Sta., Berkeley, Calif.; Univ. of Calif., B.S.F., 1950.
Reese, R. A., Jr. Forester, U.S.F.S., Susanville, Calif.; Pa. State, B.S.F., 1951.
Timmers, F. A., Sr. Salesman, Strable Hardwood Co., Oakland, Calif.; Univ. of Calif., B.S.F., 1948.

Member Grade

Vinacke, J. W., Forester, Oregon Creek Lbr. Co., Marysville, Calif.; Oregon State (3½ yrs.) (Junior, 1945).

Affiliate Grade

Taylor, R. A., Fire Prevention Officer, Calif. Div. of Forestry, Sacramento, Calif.

Ozark Section

Junior Grade

Jarrard, S. E., Umpire Route, Dierks, Ark.; Iowa State, B.S.F., 1951. (Student, 1951).
Lloyd, D. W., Jr., Forester, U.S.F.S., Danville, Ark.; Univ. of Calif., B.S.F., 1949.
Priegel, E. R., Farm Forester, Mo. Cons. Comm., Jefferson City, Mo.; Utah State, B.S.F., 1950.
Waters, J. W., 2525 W. Cherokee, Enid, Okla.; Iowa State, B.S.F., 1951.

Affiliate Grade

Rogers, J. A., Forester, Ozark Badger Co., Wilmar, Ark.; Okla. A & M., B.S.F., 1950.

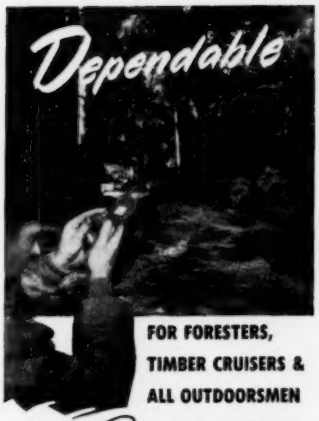
Puget Sound Section

Junior Grade

Kantzer, C. J., Logging Engr., State of Washington Institute of Forest Products, Seattle, Wash.; Univ. of Wash., B.S.F., 1949.
Spada, B., Forestry Aide, U.S.F.S., Naches, Wash.; Univ. of Wash., B.S.F., 1951.
Zeller, R. E., Box 4070A, Renton, Wash.; Univ. of Wash., B.S.F., 1951. (Student, 1951).

Member Grade

Hardy, M. E., Forester, U.S.F.S., Cordova, Alaska; Univ. of Maine, B.S.F., 1942; Univ. of Wash., M.F., 1946. (Junior, 1945).



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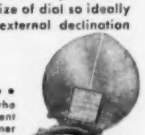

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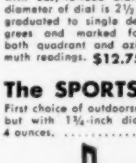

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Boeshart, J. H., Jr., Asst. Forester, St. Paul and Tacoma Lbr. Co., Seattle, Wash.; Iowa State, (Forestry), (2½ yrs.).
Buhaly, J., Soil Cons., S.C.S., Bellingham, Wash.; State College of Wash., B.S., (Forestry), 1950.
Hopkins, C. J., Tbr. Dept. Mgr., Peninsula Plywood Corp., Port Angeles, Wash.; Univ. of Wash., (1 yr.).

Southeastern Section

Junior Grade

Black, W. B., Box 232, Pell City, Ala.; A.F.I., B.S.F., 1951.
Geiger, W. B., Forester, Union Bag and Paper Corp., Savannah, Ga.; Univ. of Conn., B.S., (Forestry), 1950; Duke, M.F., 1952.
Haynes, J. D., Route No. 2, Decatur, Ala.; A.P.I., B.S.F., 1951. (Student, 1951).
Lewis, D. J., Forester, St. Regis Paper Co., Jacksonville, Fla.; Univ. of Fla., B.S.F., 1949.
Pipkin, R. L., Box 94, Bay Minette, Ala.; A.P.I., B.S.F., 1951. (Student, 1951).
Tomlinson, H. R., Forester, U.S.F.S., Decatur, Ga.; Yale, M.F., 1931, Reinstatement.
Wakefield, R. C., Cons. Forester, Coosa River Newsprint Co., Coosa Pines, Ala.; A.P.I., B.S.F., 1949.

Southwestern Section

Junior Grade

Hicks, O. M., Range Mgmt., Asst., U.S.D.I., Window Rock, Ariz.; Colo. A & M., B.S.F., 1951.

Upper Mississippi Valley Section

Junior Grade

Anderson, N. A., Forester, Iron Range Resources and Rehabilitation Comm., Pine County, Minn.; Univ. of Minn., B.S.F., 1951.
Busch, W. H., 3419 Mersington, Kansas City, Mo.; Iowa State, B.S.F., 1951. (Student, 1951).
Patterson, D. E., Asst. Mgr., Milligan Lbr. Co., Ogden, Iowa; Iowa State, B.S.F., 1951.
Ruppelt, J. M., 711 Ridgewood, Ames, Iowa; Iowa State, B.S.F., 1951. (Student, 1951).

Washington Section

Junior Grade

Coughlin, M. P., 3808 East West Highway, Chevy Chase, Md.; Purdue Univ., B.S.F., 1952. (Student, 1951).

Associate Grade

Erickson, T. A., Operation Officer, Central Intelligence Agency, Washington, D. C. Reinstatement.

Wisconsin-Upper Michigan Section

Junior Grade

Lodholz, D. H., 625 4th Ave. S., Wausau, Wis.; Mich. State, B.S.F., 1951. (Student, 1951).
Pierson, E. W., Route 1, Colgate, Wis.; Oregon State, B.S.F., 1950. (Student, 1951).
Vogel, L. O., 310 S. 15th St., Corvallis, Oreg.; Oregon State, B.S.F., 1952. (Student, 1951).

Affiliate Grade

Racey, A. G., Forester, Ontario Paper Co., Gore Bay, Ontario, Canada; Univ. of Toronto, B.S., (Forestry), 1951.

New Members and Advancements

Individuals who became members of the grades indicated during the month of January are listed below. They are eligible for participation in the activities of the Society of American Foresters, including meetings and projects of Sections, Chapters, Divisions, and Committees.

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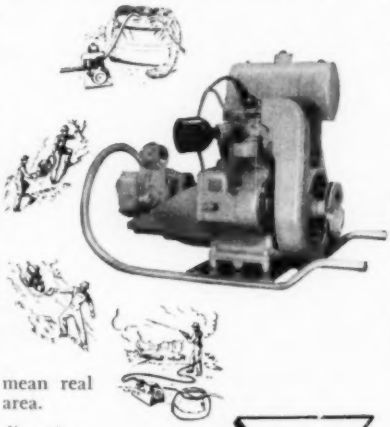

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Potter, R. Y. — Zimmer, M. R.
Rapp, C. W.

Junior Grade

Azzato, R. A., 283 No. St. Marys St., St. Marys, Pa.
Drobile, R. J., 259 Dupont St., Philadelphia 28, Pa.
Warner, J. R., 448 Stewart St., Morgantown, W. Va.

Member Grade

Northup, G. H., 98 Glenview Ave., Oil City, Pa.
Straight, F. M., Rt. No. 2, Box 101, Rivesville, W. Va.

Affiliate Grade

Stransky, J., P. O. Box 173, Toughkenamon, Pa.

Appalachian Section

Student Grade

DUKE UNIVERSITY

Markley, J. H.

NORTH CAROLINA STATE COLLEGE

Billheimer, C.S. — Raper, C. F.
Cornette, J. J. — Stokes, J. W.
Crank, P. F., Jr. — Thrash, T. L.
Crutchfield, D. M. — Webb, C. E.
Howard, P. H. — Wheless, J. H.
Keiling, F. S. — White, B. B.
Keiling, R. E. — Woodard, C. A.
Noble, M.

Junior Grade

Brown, W. L., Rt. No. 1, Dacusville, S. C.
Diehl, P. B., Box 392, Altavista, Va.
Ratts, B. W., Box 143, Elizabethtown, N. C.
Shaw, M. N., Jr., 203 Fairmont Terrace Apt., Salisbury, N. C.

Member Grade

Applefield, M., Box 13, Conway, S. C.

Central Rocky Mountain Section

Junior Grade

Anderson, R. E., 945 Euclid Way, Denver, Colo.

Member Grade

Noskowiak, A. F., 419 East Myrtle St., Fort Collins, Colo.

Central States Section

Student Grade

MICHIGAN STATE COLLEGE

Hubbell, R. J. — Stone, R. N.

UNIVERSITY OF MICHIGAN

Clee, N. F. — Novy, R. L., Jr.
Dunlap, W. W. — Widli, J. R.
McGregor, W. H. D. — Williamson, R. L.
Mynott, D. E.

Junior Grade

Leeper, F. D., 1422 Burbank Rd., Wooster, O.

Member Grade

Bell, L. E., Rm. 15, Forestry Bldg., Mich. State, East Lansing, Mich.
Kataja, T. M., 379 8th St., Manistee, Mich.
McCraw, W. E., Caterpillar Tractor Co., Peoria, Ill.

Columbia River Section

Junior Grade

Gilbert, R. R., 1157 Luzon Lane, Grants Pass, Oreg.
Konnie, S. F., Jr., Box No. 36, Mapleton, Oreg.
Swan, R. E., Ill. Valley Rgr. Sta., Cave Junction, Oreg.

Member Grade

Griffith, G. C., c/o Pope & Talbot, Inc., Oakridge, Oreg.

Gulf States Section

Junior Grade

Dean, C., Gen. Del., Cleveland, Tex.
Hardy, J. H., c/o Dr. F. L. Williams, Philadelphia, Miss.
Hutchinson, E. L., 710 Jefferson Ave., Lufkin, Tex.
Krouse, P. F., Kirby Lbr. Corp., Cleveland, Tex.
Neman, B., Box 265, Corrigan, Tex.
Readinger, E. H., 503 Ave. E., Bogolusa, La.

Member Grade

Hendricks, B. A., c/o U. S. Vets. Hospital, Waco, Tex.

Affiliate Grade

Corry, W. B., 2310 So. Grand St., Monroe, La.

New England Section

Student Grade

UNIVERSITY OF MAINE

Ingalls, A. E. Laurin, G. F.

Junior Grade

Birch, H. B., Norwich, Conn.
Catheron, A. G., 304 Parkhurst Hall, Hanover, N. H.
Ganley, R. V., Mt. Pleasant Inn, No. Pleasant St., Amherst, Mass.
Macrigeanis, S. N., 546 Central St., Manchester, N. H.
Melcher, W. W. D., 2 Goodrich St., Bingham, Me.
Whitney, H. E., Salisbury, Vt.

New York Section

Student Grade

STATE UNIV[illegible]Y OF NEW YORK

Bergmann, T. Miner, N. H.
Hoare, F. J. Roithmayr, C. M.
Howell, E. V. Weil, J. S.
Lieurance, [illegible].

Junior Grade

Bammert, R. F., Navy 138, c/o FPO, New York, N. Y.
Bauer, C. H., Jr., 356 East 5th St., Jamestown, N. Y.
Morris, W. F., Jr., 186 Church St., New Rochelle, N. Y.
Peterson, D. W., 139-20 225th St., Laurelton 13, L. I., N. Y.
Rothwell, R. J., R. D. No. 1, Fultonville, N. Y.
Weinheimer, A. J., R. F. D. No. 1, Old Chatham, N. Y.

Member Grade

Miller, R. L., 712 Cadwell St., Watertown, N. Y.

Northern California Section

Student Grade

UNIVERSITY OF CALIFORNIA

Harmon, J. R. Munster, G. H.
Hurd, R. V. Opisal, N. B.

Junior Grade

McNie, J. C., 42 Lincoln, Placerville, Calif.

Member Grade

Ramstad, G. I., U.S.F.S., Pine Grove, Calif.
Shulley, F. J., HQ. UNCACK, 8201 AU, APO 59 c/o PM, San Francisco, Calif.

Ozark Section

Student Grade

UNIVERSITY OF MISSOURI

Hembree, J. E.

Junior Grade

Walker, L. A., Rt. No. 1, Box 205A, Crossett, Ark.

Affiliate Grade

Beene, J. T., P. O. Box 669, S.C.S., Camden, Ark.
Ruffin, W. C., 100½ Main St., Rm. 10, Pine Bluff, Ark.

Puget Sound Section

Student Grade

UNIVERSITY OF WASHINGTON

Drake, E. G. Price, G. W.
Lee, R. E.

Junior Grade

Bush, Y. A., 7542 33rd Ave., N. W., Seattle 7, Wash.
Raymond, G. F., Gen. Del., Forks, Wash.

Southeastern Section

Student Grade

UNIVERSITY OF FLORIDA

Holland, R. D.

Junior Grade

Carter, V. E., R. F. D., No. 2, Gray, Ga.
Craven, F. E., Bankston Apt., Jackson, Ga.
James, K. E., 4534 Abercorn Ter, Savannah, Ga.
Kreis, E. A., 439 N. Highland Ave., N. E., Atlanta, Ga.
Langley, J. H., Rt. No. 5, Ellijay, Ga.
Livingston, G. M., Jr., Rt. 3, Bainbridge, Ga.
Mordecai, C. R., Jr., Apt. No. 7, Dolly Madison Apt., Albany, Ga.
Murray, B. R., County Forester, Jeffersonville, Ga.
Patterson, J. R., 105 Stone Rd. Dr., Greenville, Ga.
Santoro, J. E., 757 E. Duffy St., Savannah, Ga.
Smith, F. A., County Forester, Adel, Ga.
Wall, J. H., Univ. of Ga., Joe Brown Hall, Athens, Ga.
Williams, O. L., 112 N. Erwin St., Cartersville, Ga.

Affiliate Grade

McClure, C., Bellamy, Ala.

Southern California Section

Junior Grade

Lancaster, R. G., 9720 E. Rose Ave., Bellflower, Calif.

Southwestern Section

Junior Grade

Adam, J. E., Box 188, Winslow, Ariz.
Hodgin, F. M., 912 No. Jefferson St., Albuquerque, N. Mex.
Morrison, D. C., Box 532, Winslow, Ariz.
Pase, C. P., U.S.F.S., Magdalena, N. Mex.
Sahlin, K. W., U.S.F.S., Box 136, Taos, N. Mex.

Upper Mississippi Valley Section

Student Grade

IOWA STATE COLLEGE

Haskell, H. H.

UNIVERSITY OF MINNESOTA

Campbell, R. N. Hamilton, L. R.

Junior Grade

Morgan, R. L., 1721½ 2nd St., S. W., Rt. No. 3, Minot, N. D.

Washington Section

Junior Grade

Lochtefeld, J. V., No. 1 Tulane Ave., Glen Echo, Md.

Wisconsin-Upper Michigan Section

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Schmeling, R. E., 1900 3rd Ave., S., Escanaba, Mich.

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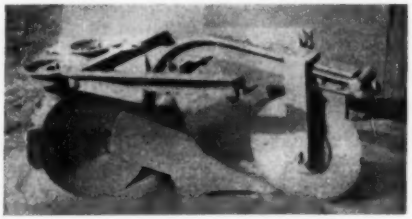

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Forestry News

Western Forestry and Conservation Association

Officers of the Western Forestry and Conservation Association for the current year are: C. D. Orchard, president, Deputy Minister of Lands and Forests, Victoria, B. C.; S. G. Smith, vice president for British Columbia, MacMillan and Bloedel, Ltd., Vancouver; E. T. F. Wohlenberg, vice president for California, Masonite Corporation, Ukiah; John L. Aram, vice president for Idaho, Boise Payette Lumber Company, Boise; A. L. Helmer, vice president for Montana, Polson Lumber Company, Polson; E. P. Stamm, vice president for Oregon, Crown Zellerbach Corporation, Portland; E. R. Ashton, vice president for Washington, Biles-Coleman Lumber Company, Omak; Clyde S. Martin, secretary, Weyerhaeuser Timber Company, Tacoma, Wash.; C. S. Cowan, treasurer, Washington Forest Fire Association, Seattle, Wash.; Carl V. Hersey, assistant secretary and assistant treasurer, Portland, Ore.; and Stuart Moir, forest counsel, Portland.

George L. Drake, president, Society of American Foresters was president of the Western Forestry and Conservation Association in 1944 and 1945, and is now an active trustee of the association.

Michigan Aids Establishment of Colombia Forestry School

Dr. Paul A. Herbert, director of the Division of Conservation Michigan State College, returned in mid-February from Colombia, South America, where he set up a forestry school, a state forest nursery, and a research program.

He had been working at the state agricultural school, Facultad de Agronomia, Medellin. Also included in his mission was a study of the over-all conservation program for Colombia.

Dr. Herbert was one of eight Michigan State College faculty members developing teaching and research programs in Colombia's two agricultural colleges at Medellin and Palmyra.

The new forestry school will have an enrollment of 20 students. It will be staffed by a Michigan State College forester, a forester from the United Nations Food and Agriculture Organization, and a native Colombian forester.

In addition to setting up the forestry program, Dr. Herbert made a rapid survey of the forest resources and conditions in Colombia. His jeep and horseback trips included visits to coffee plantations, tropical rain-forests, and mountain forests.

PAUL A. HERBERT

Forest Service Report Stresses Insects and Disease Control

The need for more progress in protecting the nation's forests against insects and disease is noted by Lyle F. Watts, chief, U. S. Forest Service, in his annual report.

During the 10-year period 1934-43, losses from fire averaged 460 million cubic feet of timber a year. During the same period, about 622 million cubic feet were lost to insects and disease, it is estimated.

In 1951 national forests returned to the U. S. Treasury $1,194,000 more than the total cost of their protection and management. During the year approximately 4,688 million board feet of timber were cut from them, the highest cut in the history of the Forest Service. Annual timber production from the national forests could be stepped up about 50 percent if access roads were built into areas now inaccessible.

To keep timber losses from insects and disease as low as possible, Mr. Watts recommends more federal research on insects and disease, a well organized system of detecting infestations, and quick counter attacks.

He commended the forest fire prevention campaigns carried on by state and federal forest services with the sponsorship of the Advertising Council, Inc. and through "Keep Green" programs.

On one-fourth of the commercial forest lands of this country, mostly public forest lands and large industrial holdings, management is good; and on another one-fourth, management is fair. "But more than half of the commercial forest land is still being handled poorly or destructively," Mr. Watts declared.

To aid private land owners in good forest management and marketing, the Forest Service cooperates with the states in supplying on-the-ground technical assistance. In 1951 some 240 project foresters working under the supervision of the state foresters gave assistance to 4,716 woodland owners in 38 cooperating states. Their work resulted in improved forest management on 2,558,091 acres of forest land.

The report also recommends increased cooperative aid from state and federal forest services for tree planting on private lands. State nurseries this year distributed 400 million trees to private land owners.

Another part of the program for timber abundance calls for action to stop further forest destruction and deterioration through public control of cutting by the individual states. Sixteen states already have laws regulating forest practices. "To assure a consistent nation-wide pattern, a federal law setting up basic standards will be needed." Watts said.

Watts reports that hundreds of new mining claims were filed on national forest land last year, adding to the management problem created by some two million acres presently covered by mining claims. Many of these claims, which make effective land management impossible in many areas, are believed to have been located for other purposes than mining, such as summer home sites, rights to valuable timber, and control of access routes to large tracts of government timber.

Watts presented two possible solutions to the mining claim problem which would enable legitimate miners to prospect for and develop needed mineral resources and enable the Forest Service to manage the non-mineral resources of the national forests for the interests of all. These solutions are: (1) separation of surface and mineral rights, or (2) leasing of lands for minerals.

Lands Excluded From Chugach National Forest

Approximately 76,000 acres have been eliminated from the Chugach National Forest by public land order.

The elimination of the lands from the national forest, Director Marion Clawson of the Bureau of Land Management said is a cooperative effort by that bureau and the U. S. Forest Service to foster settlement and development in favorable areas along the Anchorage to Seward highway.

The lands extend for 19 miles along the north shore of Turnagain Arm on the south flank of the Chugach Mountains from Alaska Railroad mileposts 71 to 91. The newly completed Anchorage to Seward Highway makes the coastal lands of the area readily accessible by automobile. The western boundary of the area is 24 miles distance from Anchorage.

The lands were examined by the Bureau of Land Management last summer to determine their highest use suitabilities in order to provide for prompt and orderly settlement and development. Nearly all the lands adapted to settlement and development lie on the lower wooded terraces of Glacier Creek, Bird Creek, and Indian Creek.

In anticipation of considerable demand for home, cabin, and business sites, Regional Administrator Lowell M. Puckett had 40 small tracts surveyed along the Crow Creek Road in the immediate vicinity of Girdwood in advance of the elimination. These will shortly be made available for lease and purchase under the Small Tract Act. Additional tracts will be surveyed and classified for such purposes at Bird and Indian as need arises. Lands between the highway and the railroad and Turnagain Arm are for the most part reserved for a scenic strip, and certain areas are set aside for public service sites.

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Edward Engen (1922-1951)

Edward Tomkins Engen, 29, forester with the Berkeley Forest Insect Laboratory, U. S. Bureau of Entomology, died of acute leukemia in San Francisco, December 30.

Mr. Engen was on a year's leave of absence from the bureau and was enrolled in the University of California when the illness first became apparent.

He was born in Perham, Minn., October 17, 1922. He attended the University of California, receiving his bachelor's in forestry in 1948. From 1948 until 1951 he was a member of the Forest Insect Laboratory staff.

He leaves a wife and two year old daughter, both of Berkeley.

Forestry Radio in Civil Defense Role

Minnesota and Ontario Paper Company's FM radio network, spreading over its logging operations in northern Minnesota and Ontario, has been made available to serve in the defense of the United States and Canada.

Mando's high frequency radio system has been incorporated into the Civil Defense organization of Minnesota and has been formally offered to Ontario authorities. Bushmen, whose normal pursuit is the harvesting of pulpwood, are now volunteering to serve on a proposed international Civil Defense team.

Far out in the wilderness, loggers can scan the skies and quickly report by radio, the appearance of any aircraft over their remote areas. These warnings can be rapidly flashed over the forest to towers located at International Falls, Minn., and Fort Frances and Kenora, Ontario. They can then be relayed to a filter center at Minneapolis.

Kimberly-Clark Inaugurates Pest Control Program

The Kimberly-Clark woodlands department has opened a new field in applied pathology and entomology in forestry. In what is believed a "first" for the pulp and paper industry, the woodlands department has added a forest pathologist and a forest entomologist to its staff.

Paul Flink, a recent graduate of Syracuse University and the University of Michigan, is the forest entomologist for Kimberly-Clark. Donald Prielipp of Wausau and a recent graduate of the University of Minnesota, is the forest pathologist.

Generally the study of forest diseases and forest insects is left to government specialists, but Kimberly-Clark is going a step further with its recent staff additions. It is pointing toward practical application of forest pathology and entomology to protect its forest operation.

Kimberly-Clark's pathologist and entomologist will work as contact men with governmental agencies studying forest disease and insects. They will make tests and conduct experiments of their own for the corporation and they will apply recommended control procedures.

Awarded Research Assistantship in Forest Hydrology

James L. Smith, doctorate candidate in the Graduate School at Michigan State College, has been awarded a new research assistantship in forest hydrology. Smith was formerly an instructor in forestry at Mississippi State College. He has two undergraduate degrees, in agriculture and forestry, and a masters degree in forestry from the University of Georgia.

The research assistantship in forest hydrology was authorized for the first time by the Michigan Agricultural Experiment Station in 1951 for furthering research in the management of wooded watershed areas of Michigan. Research facilities consist of a forested watershed located at the Rose Lake Wildlife Experiment Station near East Lansing and two agricultural watersheds located on the campus of the college. Hydrologic installations were made in 1940 by the Soil Conservation Service in cooperation with the Michigan Department of Conservation, the Michigan Agricultural Experiment Station, and the Michigan State College Forestry Department.

New Logging Engineer, American Pulpwood Association

The American Pulpwood Association has announced the addition to its staff of James A. Holekamp as logging engineer. He comes to the association from the Coosa River Newsprint Company, Coosa Pines, Ala., where he served as woodyard shift foreman for more than two years.

Previous to his experience in Alabama, he served for three years with the William Bonifas Lumber Company in northern Michigan as forester connected with experimental pulpwood logging operations.

During World War II, he served three years in the U. S. Navy. Upon release from the Navy he completed one year of graduate work in cost control in the logging industry at the University of Michigan where he obtained his masters degree in 1946. He received his B.S.F. degree from the same school in 1943 where he majored in industrial forestry.

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Photo by N.E. Pulpwood Research Center

Write for Bulletin on Debarking

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National Forest Receipts Reach New High

National forest receipts for the last 6 months of 1951 reached a new high of $41,790,145. This represents an increase of nearly 50 percent over the receipts of $27,981,665 for the same period in 1950.

Collections by the Forest Service from the sale of national forest saw timber and other forest products such as pulpwood, fuel wood, and naval stores totalled $41,080,573 for the 6-month period ended December 31, 1951 as compared with $27,339,567 taken in during the same period a year ago.

National forests reported a timber cut of 2,897,529,000 board feet in the last half of 1951. This represents a slight increase over timber cut in the same period a year ago.

Rental of lands to individuals and organizations for recreation facilities camp sites, organization camps, and rights-of-way brought in $351,770 for the 6-month period, an $18,143 increase over such receipts a year ago. Lands leased for reservoir sites and water power netted $31,485 for the last half of 1951 as compared with the $14,120 taken in during the same period last year.

Fees collected from the grazing of cattle, sheep, and horses on national forest lands rose from $294,349 for the last half of 1950 to $326,315 for the last half of 1951.

Redwood Region Conservation Council

E. T. F. Wohlenberg, president of the Redwood Region Conservation Council, has announced the appointment of five committees to carry out the new expanded RRCC program for 1952.

At the same time he announced the appointment of Fenwick C. Riley, resident manager, Simpson Logging Company, as his special assistant to represent him in the northern part of the region.

Robert B. Jensen, Jensen lumber company, Willits, was appointed chairman of the membership committee which will direct the effort to expand the sustaining membership of the organization to include wood processing firms, suppliers, ranchers, and non-operating timber owners.

Walker B. Tilley, forester for the Masonite Corporation, Ukiah, remains as chairman of the program committee which will formulate the 1953 program as well as recommend changes or additions to the program for the current year.

The region-wide fire prevention committee will be headed by Henry K. Trobitz, Simpson Logging Company, Klamath. The forest management committee, concerned primarily with urging greater compliance with the state's Redwood District Forest Practice rules, will be lead by A. O. Lefors, Hammond Lumber Company. A committee designed to concentrate on conservation education among the youth of the area will be headed by Fern Freeman, Eureka.

White Pine Booklet

The story of northeastern white pine—its present day uses and grading standards—is told in an attractive booklet, *Northeastern White Pine*, prepared by the Policy and Planning Committee of the Northeastern Lumber Manufacturers Association, Inc.

Copies are available from the association's office, 271 Madison Avenue, New York 16, N. Y.

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RICHMOND, INDIANA

ROBERT N. HOSKINS, 34-year-old industrial forester with the Seaboard Air Line Railroad Company, was chosen Norfolk, Virginia's Outstanding Young Man for 1951. The photo shows Paul G. Kaplan, r., president of the Norfolk Junior Chamber of Commerce, presenting the award to Hoskins. This is the first time the Distinguished Service Award has been given in Norfolk since 1940, according to William Borum, chairman of the Jaycee committee in charge of arrangements for this award. Hoskins is a member of the Norfolk Jaycee chapter, but Jaycee membership is not requisite to receiving the honor. It is, however, limited to men of 20 to 35 years of age. Hoskins wrote and directed the Norfolk Jaycee tree-planting program which was accepted as a state project and later approved nationally by the U. S. Junior Chamber of Commerce. He has served as local and state chairman of the Jaycee conservation committee for three years and for the national organization two years.

Yoder Named for Forest Industries Post

Appointment of Ralph E. Yoder, Jr. as field representative for the Western Forest Industries Association has been announced by R. T. Titus, executive vice president. Yoder, who was employed in Pacific Northwest lumber activities from 1940 to 1946, was with the Structural Clay Products Institute, Washington, D. C., as director of national mason promotion department and industry defense service from July 1946 to September 1951. He was director of the Architects Trek to Europe, American Institute of Architects, September-October, 1951.

He was graduated in 1938 from Iowa State College, with a bachelor of science degree in forestry. He studied law at George Washington University, Washington, D. C., in 1947.

Employed by the Ivory Pine Co., Klamath Falls, Oreg., 1940-42, Yoder worked through sawmill and woods up to the position of assistant logging boss. In 1942 he was employed by the Albany Plylock Corp., Albany, Oreg. and the Samuelson Lumber Co., Eugene, Oreg. He was with Dant & Russell, with headquarters at Vancouver, and was material supervisor and assistant purchasing agent for Poole, McGonigle & Jennings, ship repair and drydocking, Portland in 1943 and 1944. From October 1944 to June 1946, Yoder was on the staff of the West Coast Lumbermen's Association, Seattle, in the trade extension division, where he promoted the home planners institute national program. He is a member of the Society of American Foresters.

Lake States Headquarters of AFPI Now in Chicago

John R. Calkins has been named Lake States manager of American Forest Products Industries, with headquarters in the Socony-Vacuum Building, 59 East Van Buren St., Chicago 5, Ill.

Prior to Calkins' appointment the AFPI Lake States district was headed for 20 months by John M. Rottier, with offices in Milwaukee, Wis.

Calkins, a native of South Lyon, Mich., is a graduate of Michigan State Normal College. He also attended Ohio State University. He has been engaged in free lance writing and photography for several years.

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Forester Granted Patent on Fire-Fighting Unit

A U. S. patent pending since 1947, has been granted A. B. Everts, Portland, Ore. for his "device for setting and controlling backfires." Everts is an equipment engineer in the regional office of the U. S. Forest Service.

The device, a unit designed for pulling behind a truck or other vehicle, is capable of setting and extinguishing backfires at rates of speed up to 8 miles per hour in light fuels. The federal government has free use of Evert's invention.

Considerable interest in this unit has been shown by land management agencies where protection of large grass areas on relatively gentle terrain is a primary problem. Everts points out that burning instead of plowing a fire line leaves the soil unbroken, greatly reducing the possibility of erosion; particularly along highway and railroad fire lanes.

One part of the fire-fighting unit sets the backfire. It resembles a flamethrower. The other important component consists of a series of nozzles through which water is sprayed to put out the fire on the outside of the line.

Everts, who began his Forest Service career in 1924, was fire control staff officer on the Snoqualmie National Forest from 1942 to 1949. A patent is now pending on another, improved model of his fire-fighting unit.

Earl Porter Elected President, S.P.C.A.

Earl Porter, general manager of the Woodlands Division of the Southern Kraft Division of International Paper Company, Mobile, Ala., was elected president of the Southern Pulpwood Conservation Association at the conclusion of its annual meeting January 16. A. G. Curtis, in charge of wood procurement for Gaylord Container Corporation's mill at Bogalusa, La., was elected vice-president. J. H. Keener, wood manager for the Canton, N. C. division of The Champion Paper and Fibre Company, is the retiring president and remains on the board of directors as a director-at-large.

Over 300 representatives of member pulp and paper mills, suppliers of pulpwood, and industrial and publicly employed foresters attended the association's meeting held in Atlanta, Ga.

Fernhoppers Banquet

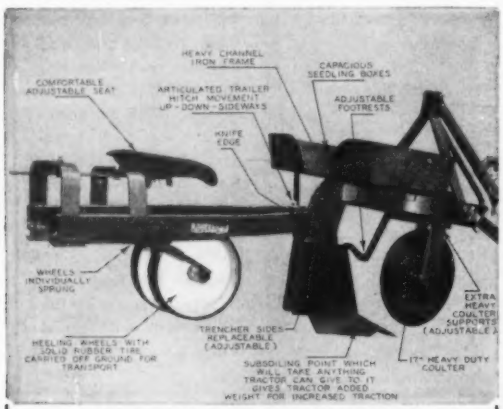
The Forestry Alumni Association in cooperation with the Forestry Club of Oregon State College sponsored the 20th annual Fernhopper's Banquet on February 23rd.

The afternoon program consisted of a panel discussion on "The Development of the *Fomes pini* Study in the Northwest" and tours through the McDonald Forest, the new club cabin, and the Oregon Forest Products Laboratory.

George L. Drake, president of S.A.F., was the guest speaker at the banquet held in the Memorial Union Building.

Range Pioneers Retire

Two pioneers in the range management activities of the U. S. Forest Service retired December 31, 1951. Paul H. Roberts, chief of the Division of Range and Wildlife Management for the Northern Region, with over 37 years of service, and Leon C. Hurtt, headquartered in Missoula as special staff assistant for the Washington office Range Management Division, with over 38 years of service.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Frank J. Jefferson Retires

Frank J. Jefferson, who has been in charge of the U. S. Forest Service fire-control activities in California since 1945, retired in January.

He was first employed by the Forest Service in 1911, in the Lewis and Clark National Forest in Montana. He spent the next 24 years in Idaho and Montana in various administrative and staff positions, including assignments as forest supervisor of the Selway and Kootenai national forests. He was transferred to California in 1935, and has been assistant regional forester in charge of fire control since 1945.

Jefferson is succeeded by M. M. Nelson, assistant chief of fire control for the entire Forest Service, with headquarters in Washington, D. C. Nelson's early years were spent in the San Fernando Valley of southern California. He is a graduate forester from the University of Washington, and was employed as fire warden for the Los Angeles County Fire Department from 1931 to 1933. Nelson served as district ranger, and later, on the Umpqua National Forest in Oregon, as forest supervisor. He had been assigned to the fire-control position in Washington since 1950.

Synthetic Soil Conditioner

A synthetic chemical soil conditioner, the first product of its kind to achieve effective and economical control of rain erosion, has been developed by Monsanto Chemical Company.

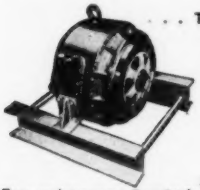
The trade name of the new product is Krilium, a synthetic polyelectrolyte. It is expected to have wide application in controlling slope erosion problems created by major earth-moving construction projects. In addition, it shows promise in the control of spot erosion problems in productive agricultural areas.

A unique feature of the new soil conditioner is its simplicity of application when used for erosion control. Krilium, grass seed, and fertiliber can be applied to slopes and freshly graded areas from mobile equipment in a single operation by means of a water spray. Alternatively Krilium, seed, and nutrient fertilizer can be dusted simultaenously on the surface by ordinary mechanical spreaders at the rate of approximately one pound of Krilium for every 100 square feet to be treated.

After it becomes wet, Krilium forms a water-permeable plastic film on the surface of the ground during the period necessary for establishment of a permanent cover crop in erosion control. In addition to providing marked resistance to the erosive action of water, including splash erosion by raindrops, the product improves conditions for seed germination and subsequent growth of the grass or vegetative cover..

Wood Preservers Standards

W. R. Yeager, inspection engineer for Western Electric Company, and president of the American Wood-Preservers' Association, announces the issue of a completely revised A.W.P.A. Manual of Recommended Practice. The manual contains all the current standards of the association relating to preservatives, treatment of commodities, and analysis methods used in the impregnation of wood for protection against fungi, insects, marine borers, and other destructive agencies. It also contains miscellaneous standards for the purchase and preservation of forest products, inspection and care of treated wood, as well as conversion factors and correction tables. Copies are available from the headquarters of the association, 839 17th St., N. W., Washington 6, D. C.



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Forestry Employment

S.A.F. members wishing the Journal's assistance in securing forestry employment are privileged to insert from one to three, consecutive, 60-word advertisements in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiation.

Positions Available

Recent forestry graduate for assistant forester's job in timber management. Prefer man with family. Location Southeast Oklahoma.

Details on request. Box S, Journal of Forestry, Mills Building, Washington 6, D. C.

Wanted experienced forester to fill the position of Woodland Forester at Sandpoint, Idaho. Man must be capable of cruising and developing management plans and must have ability to sell himself and sound, economical forestry to small private woodland owners. Further information supplied upon request. Write, giving detailed information and references. Immediate placement possible.

State of Idaho Forestry Department, State House, Boise, Idaho.

Opportunity for several young foresters to obtain experience in logging and silvicultural work on intensive forestry operations in central New England. Chance for right party to start own business.

Fred M. Hunt, West Rindge, N. H.

Positions Wanted

Graduate forester, 29, M.F., Yale 1949, now employed by a State Forestry agency, desires position with better opportunity in a progressive forest-owning or wood-utilizing firm in Northeast. Experience has included work on forest inventories, timber management, and public contact. Background in sciences, economics. Veteran; married, one child. References and details upon request.

Box A, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S. 1923 graduate with U. S. and foreign experience in general forestry, desires position with progressive forest industry in U. S. or foreign country. Now employed as forester in middle-west. Reference and detailed information on request.

Box E, Journal of Forestry, Washington 6, D. C.

Forester, M.F., Yale 1947, age 31, desires relocation in East for better opportunity. Now employed as scaler, lumber grader, and timekeeper for pulpwood and sawmill industry in Northeast. Experienced in cruising, mapping, land survey, sawmilling, lumber grading, pulpwood and log scaling, logging camp clerking, blister rust control work, fire lookout and suppression. Army training as photogrammetrist Married, 3 children. Further details and references upon request.

Box F, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S.F.; 45, married, desires job in Southwest, preferably Arizona. Twenty years experience in practical forestry, forest protection, and utilization. S. A. F. Member. Will consider any offer in forestry, nursery, forest protection, utilization, manufacture, or sales. References and details on request.

Box G, Journal of Forestry, Mills Building, Washington 6, D. C.

Graduate forester, B.S., M.S., married, no children, 30 years old, desires position in private industry with concern large enough to insure advancement if capabilities are proven. Present duties at hardwood mill are operation of dry-kilns and yard supervision, also buy stumpage and supervise cutting and logging. Have knowledge of hardwood rules; familiar with all phases of mill operation.

Box H, Journal of Forestry, Mills Building, Washington 6, D. C.

Sawmill Operators School in North Dakota

The need for training sawmill operators in North Dakota, a state devoted to farming and ranching, developed through attempts to utilize the few scattered woodland areas throughout the state which are capable of producing several million board feet of forest products annually if properly managed and utilized.

Utilization has been a serious problem. The wooded areas are a considerable distance from established forest products industries, and the sawmills in the state have been producing low grade lumber. The principal species are aspen and cottonwood, which present problems when sawed into lumber, especially if care is not taken to prevent the log from springing. The lumber must be properly piled to prevent warping and checking.

The objective of the sawmill operators school is to improve sawmilling technique and lumber piling technique.

Arrangements have been made to obtain a No. 1 Corley sawmill and plans have been completed to have the school the first week in March.

The Turtle Mountain Woodland Association composed of farm woodland owners is planning to have a series of demonstrations using the Corley sawmill.

Fellowships and Scholarships, Oregon State College

The Orville R. Miller Memorial research fund was increased by a gift of $1,000 recently according to Paul M. Dunn, treasurer of the Forestry Research Foundation. The grant was made by Mrs. Kathryn Miller of Portland.

The research fund is being used to finance studies in the field of wood utilization at Oregon State College. Four students are now being aided in graduate programs; two in wood chemistry and two in forest products.

A grant of $2,500 from the Booth-Kelly Lumber Co. of Springfield, Ore., has been received by the School of Forestry to be used to help finance a study of the use of power saws and their relation to fire hazards in the forests.

Considerable concern has been raised by timber landowners and foresters because of the number of fires during the 1951 season caused by power saws. A special committee of the Western Forestry and Conservation Association recently asked that such a study be made.

Nicholas V. Mason of Vancouver, B. C., has been awarded the Weyerhaeuser Fellowship in forestry for the current school year. The award will provide a sum of $1,000 for graduate study in forest management. Mason is a graduate of the University of British Columbia and a veteran of World War II. He has had considerable experience with both the government service and with logging companies in Canada. His field of study will include an examination of cutting priorities for over-mature stands of the coastal forests.

TVA Nursery to Reopen

Tennessee Valley Authority's forest tree nursery at Muscle Shoals, Ala., closed last year by a shortage of funds, will be reopened this year. According to John Oliver, TVA general manager, the Clinton, Tenn., nursery alone is unable to keep up with the ever increasing demand for seedlings. Combined production for the two nurseries for the 1952-53 planting season will be about 26 million seedlings. Of this total, 10 million will be produced for the U. S. Forest Service, the Army Engineers, and the State of Tennessee under contracts which reimburse TVA for the cost of production.

CONRO L. OLIVE, JR.

Charles B. Umland, former nursery superintendent at Muscle Shoals, is being transferred to TVA's forestry office at Norris, Tenn., as supervisor of all nursery production. Conro L. Olive, Jr., a forestry graduate of Alabama Polytechnic Institute, will be the new superintendent at Muscle Shoals.

TVA's two nurseries, in operation since 1934, have turned out over 245 million seedlings for reforesting unproductive lands in the Tennessee Valley. Last spring 15 million TVA seedlings were distributed to 4,700 landowners by the state forestry divisions of the valley states.

SCS Report Stresses Progress . . . And Need for More

The rapid progress in soil conservation for the last 20 years is the keynote of the annual report of the Soil Conservation Service for the 1951 fiscal year. The report emphasizes the need for soil conservation to aid the current mobilization effort and stresses the fact that total conservation, not partial conservation, is essential.

This is the 17th and last annual report of H. H. Bennett, who was chief of the Soil Conservation Service from its beginning until he was succeeded last November by Robert M. Salter, the present chief.

Bennett points out that almost nothing had been done about permanent conservation on most farm and ranch land of the nation prior to 20 years ago; but that now, more than a fifth of the basic conservation job needed for full protection of farm and ranch land has been completed.

The Service helped 128,502 farmers and ranchers to develop conservation plans on 36,259,299 acres last year. This brought the total as of June 30, 1951, to 883,348 plans covering 246,740,009 acres of farm and ranch land. Farmers applied the needed conservation measures to 25,596,642 acres last fiscal year, making a total of 140,404,405 acres on which conservation measures have been applied.

Soil conservation surveys, to provide the basic information for planning and applying complete conservation plans, were completed on 35,181,686 acres last year making a total of 376,323,538 acres "inventoried" up to July 1.

The increasing importance of soil conservation districts, of which there are now about 2,400 organized and operated by farmers and ranchers under state laws, is emphasized. A financial statement shows that the Service spent a total of some 64 million dollars for the fiscal year. Of this amount, about 52 million was for regular operations in soil conservation districts. Around 7 million was used for flood control work. About one and a half million was for research.

Forest Consultant Enlarges Staff

C. D. Shultz & Company, Ltd. announce the appointment of Don McColl as logging and logging management consultant. McColl brings to this appointment 30 years' experience in all phases of logging in British Columbia. C. D. Shultz & Company is located at 811 West Hastings Street, Vancouver, B. C.

Arthur A. Wood (1886-1952)

Arthur Alexander Wood, retired supervisor of the Nantahala and Monongahela national forests, succumbed to a heart attack while at home in Elkins, West Virginia on January 28, 1952.

"Arthur A.," as he was widely and affectionately known, had a career with the U. S. Forest Service dating from 1913, the earliest days of the national forest system in the southern Appalachians. Under the mandate of the times, much of his life was given to the very tremendous task of building into public ownership the devastated mountain forests of the region of nearly a generation ago. He rose to direct the administration at different times of public properties aggregating over a million acres. During his supervisorships he endeared himself to many young men in and out of the profession of forestry.

His membership in the Society of American Foresters dates from 1929. He was the subject of "We Present" in the September 1949 JOURNAL, after retirement from the Forest Service on June 30, 1949.

Following retirement, he maintained an active interest in church life, the profession of forestry, and civic affairs, most recently serving as chairman of the West Virginia Forest Council, and president of the Elkins, W. Va. Chamber of Commerce.

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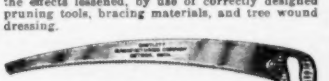
Damage by ice and wind often can be avoided, or the effects lessened, by use of correctly designed pruning tools, bracing materials, and tree wound dressing.

No. 127 PARAGON SAW. This curved blade, draw cut pruning saw is ideal for all-around pruning. Best quality saw steel. Easy grip handle.

This drop-forged tool steel 9-inch Hand Pruner has a crucible steel blade and hardened hook. Unsurpassed. Ask for catalog showing a complete line of pruning tools.

Two complete tools . . . longest section 72 in.... EASILY CARRIED IN SMALL CAR.

	Length	Weight lbs.
30 in. Pruner		2¾
30 in. Saw		1½
72 in. Section		2
72 in. Section		1¾
Total Weight		8

This combination can be quickly and easily assembled to make either of these two tools! Longer poles available if desired.
1 Heavy Duty Tree Trimmer (1¼" capacity)... 14½ ft.
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Pine Management Symposium to be Held at LSU

The School of Forestry, Louisiana State University, Baton Rouge, will sponsor a forestry symposium on the management of young, even-aged stands of southern pine. The meeting will be held at the university on March 13 and 14. A number of papers on selected topics are to be presented, each paper will be followed by a period of open discussion.

Chas. A. Connaughton, regional forester, U. S. Forest Service, Atlanta, Ga., will be moderator for the conference. Although participation is expected primarily from the four-state area of Texas, Arkansas, Louisiana, and Mississippi, all interested persons are invited to attend. For further details regarding the symposium write Professor A. B. Crow, School of Forestry, Louisiana State University, Baton Rouge 3.

Michigan Reports Progress

Conservation nudged deeper into the public consciousness and colored more individual thought and action in Michigan in 1951 than in previous years, according to the year-end report of the Michigan Conservation Department.

The state hit a new low in forest fires, shattering the 1950 record prevention mark. Continuation of the intensified prevention campaign resulted in holding 671 fires to 4,317 acres damage. The 1950 mark, best since 1941, was 873 fires and 5,606 acres. Fire control men had excellent cooperation of press, radio, television, theatres, magazines, and other publications. For the second year in a row, more than 300 dailies and weeklies printed special "fire prevention" reminders, with the *Bay City Times* given credit for the top individual job. The recently revised brush burning permit law was strongly enforced in the spring and fall high hazard periods. Experimental work and construction of new type fire control equipment underway in 1951 will continue in 1952.

The first commercial-size cutting of planted red pine stock ever made in a state forest, starting in the Higgins Lake forest, marked a milestone in state conservation annals. The first jack pine plantation cutting occurred about seven years ago.

Bettering 1950 record production of nearly 14,000,000 trees, the department supplied 18,000,000 trees for planting on state and private land during 1951. First seeding in the newly acquired Wyman nursery at Manistique was made last spring and first seedling stock will be available in the fall of 1952. Newly designed planting machines which make a "scalp" instead of a conventional furrow were completed and saw first regular use in the fall planting season.

A statewide forest pest detection program, inaugurated in 1950 in cooperation with other agencies, began bearing fruit in 1951. The first survey work on oak wilt indicated the disease was present only in isolated spots in 14 southern counties. The forest tent caterpillar was expected to strip eastern upper peninsula trees again in 1952, but increased parasite evidence gave promise of abatement of the infestation.

Essay Contest for Western Forestry Students

A contest open to undergraduate forestry students, except seniors registered for the fall of 1951, in the six accredited forestry schools of California, Idaho, Montana, Oregon, Washington, and British Columbia is announced by the Western Forestry and Conservation Association. Contestants may select their own subjects treating of any aspect of forestry of vital concern.

Essays must be submitted to the deans of the schools by June 1, 1952. A first prize of $100 and a second prize of $75 will be awarded. In addition, the winners will be the guests of the Western Forestry and Conservation Association annual conference in Victoria, B. C., December 10 to 12.

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New York Forest Preserve Policies to Be Re-examined

The New York State Conservation Department has proposed a public re-examination of policies regarding use of the 2½ million-acre Adirondack Forest Preserve to determine whether this property is managed "in the best interests of the most people."

Devoting six pages to discussion of the problem, the department's magazine, *The Conservationist*, reaffirmed the need for its policy of protecting the wilderness character of the preserve, asserted its belief that the state should "keep out of the closed cabin and hotel business" in the preserve, and cautioned against any constitutional change which might open the way to any form of commercial exploitation of the forest preserve for private gain.

Nevertheless, the department suggested that some changes in management policy obviously are required to promote healthy forests, a greater abundance of wildlife, and an increased use of the forest preserve for recreation by those now physically locked out. It emphasized its belief that all this could be done without sacrificing the wilderness character of the vast public property.

Pointing out that "without question the Forest Preserve is our most valuable common holding," Conservation Commissioner Perry B. Duryea led off the discussion with the proposal that funds (which may reach $2½ million) resulting from the salvage of timber blown down on forest preserve lands by the 1950 storm be "put back into the forest preserve—either to improve our present management and our facilities for the public, or to acquire additional land, or both."

Products Publications

The Forest Products Research Society has just issued a 12-page *Catalogue of Publications*, which will be of interest to all producers and users of wood and wood products. It lists over 200 individual publications of the society by subject matter as well as by year of issue. It describes contents of five Annual Proceedings issues, and the first volume of the new Journal of the FPRS. An order form and directions for placing orders are also included.

Copies of the catalogue may be obtained by writing the Forest Products Research Society, P. O. Box 2010, University Station, Madison 5, Wis.

Nisqually Nursery Ships 40-Millionth Tree

At the Forest Industries Tree Nursery, Nisqually, Wash. in January the 40,000,000th seedling tree rolled along the sorting belt, past alert girl inspectors to be counted by the photoelectric eye mechanism which tumbles every 50 trees into a wrapping hopper.

Since the founding of this tree nursery by the private forest landowners in 1941 ten crops of seedling forest trees have been raised. Lifting of the current crop is now in progress and will continue until April. After the 40 millionth tree has been packed and shipped to some landowner in western Oregon or Washington, another 6,000,000 trees will be lifted and shipped this year.

This 46 million tree crop will have planted 82,000 acres of idle forest land, according to N. E. Bjorklund, nursery manager. "These trees will cover 130 square miles," Bjorklund points out.

Trees from the non-profit forest nursery have been planted on taxpaying forest lands throughout western Washington and Oregon. Douglas-fir makes up the bulk of the crop, but hemlock, cedar, and spruce have been grown in limited numbers and even a few rare dawn redwood trees from seeds brought in from China were carefully tended as an experiment.

In an effort to raise a superior race of trees, care is taken to make certain that seeds are picked only from selected trees and that seedlings are returned to the district and elevation where the parent trees grew.

Hodgkins Joins Alabama Staff

Earl J. Hodgkins has joined the staff of the forestry department of the Alabama Polytechnic Institute agricultural experiment station as associate professor and associate forester.

Hodgkins will fill the vacancy that occurred when W. B. DeVall was made head of the department. He will teach courses in dendrology, silvics, and forest ecology. A portion of his time will be devoted to forestry research problems.

His experience includes work with the California Forest and Range Experiment Station, Soil Conservation Service, Scott Lumber Company of California, and Michigan State College. He is a native of Indiana, and he received his B.S. degree from Michigan State College, and his M.S. degree from the University of California.

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Forest Service to Review Timber Resources

A review of the timber resources of the United States is being launched by the U. S. Forest Service. It will take at least two years to complete, and will bring up to date the information on timber resources, re-analyze prospective requirements, supplies, and growth of timber, appraise today's timber-conservation programs, and chart a course for American forestry, according to Lyle F. Watts, chief of the Service. Advice in planning the project and help in determining the facts of the forest situation will be sought from state and private forestry agencies, the wood industry, and conservation organizations.

"It soon will be eight years since the Forest Service last reviewed the United States timber balance sheet," said Mr. Watts. "These have been eventful years. The nation-wide forest survey, a continuing study, has shown that marked changes have been taking place in American forestry. There is pressing need to keep our information up to date and to adapt our policies as the times require."

Mr. Watts cited a number of strong forces that have worked both for and against a well balanced timber economy in this country since World War II.

On the positive side, industrial and other private timber owners, who hold the bulk of United States forest lands, have taken a heightened interest in timber growing. Progress has been made in the Tree Farm Program and other programs sponsored by industry, in state-federal programs of fire control and of technical forestry assistance to landowners, and in more intensive management of public forests. Progress has been made, too, toward fuller utilization of the timber harvested.

On the negative side, efforts to manage, protect, and build up the nation's depleted timberlands are still inadequate, despite recent progress. At the same time, prospective requirements for wood are very high. Population is growing fast. The years since World War II have seen a great rise of wood-using industries, especially the pulp and paper industry in the South. New inroads have been made by forest insects and diseases. These developments have put an added drain on forest resources.

The timber resource review will be made under the general direction of Edward C. Crafts, assistant chief of the Forest Service in charge of program planning, and William A. Duerr, assistant chief of the Division of Forest Economies.

Butler Resigns AFPI Office

Edwin R. Butler, for the past two years assistant managing director of American Forest Products Industries, Inc., resigned effective February 1, and has joined the staff of Timber Engineering Co.

A former Memphis, Tenn., newspaperman and hardwood lumber association official, Mr. Butler was in charge of AFPI's industry division and directed editorial and field coordination.

1952 National Meeting Forest Products Research

Ralph H. Bescher, manager, Technical Department, Wood Preservation Division, Koppers Company, Orville, Ohio is general chairman of the 1952 national meeting of the Forest Products Research Society to be held in Milwaukee, June 23 to 25th. Kenneth G. Chesley, director of research, Crossett Lumber Company, Crossett, Ark. and president-elect of FPRS is chairman of the technical program.

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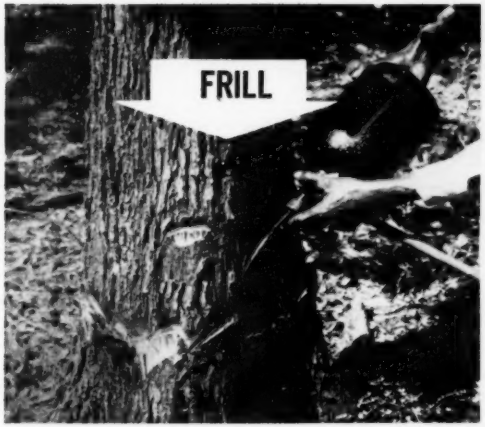
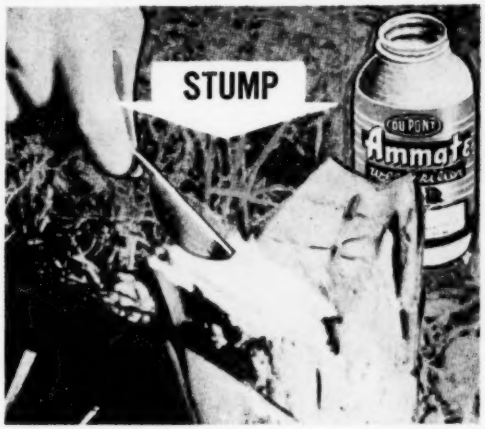


1 For large trees, hack overlapping cuts into the sapwood around the trunk. Pour in enough "Ammate" solution (4 lbs. to a gallon of water) to wet the cut surface all around the tree.



3 Cut small trees with a V-shaped stump. Put a tablespoonful of "Ammate" crystals in the V. You can also use "Ammate" on larger stumps to prevent sprouting.

2 On tough trees, chop notches every six inches near the ground. Put a tablespoonful of "Ammate" crystals in each notch. This deadens even blackjack oak with little resprouting.

4 On seedling trees or sprouts, spray the green leaves and stems when they are fully leafed out using "Ammate," ¾ lb. per gallon of water. Let trees or sprouts stand a year for best kill.

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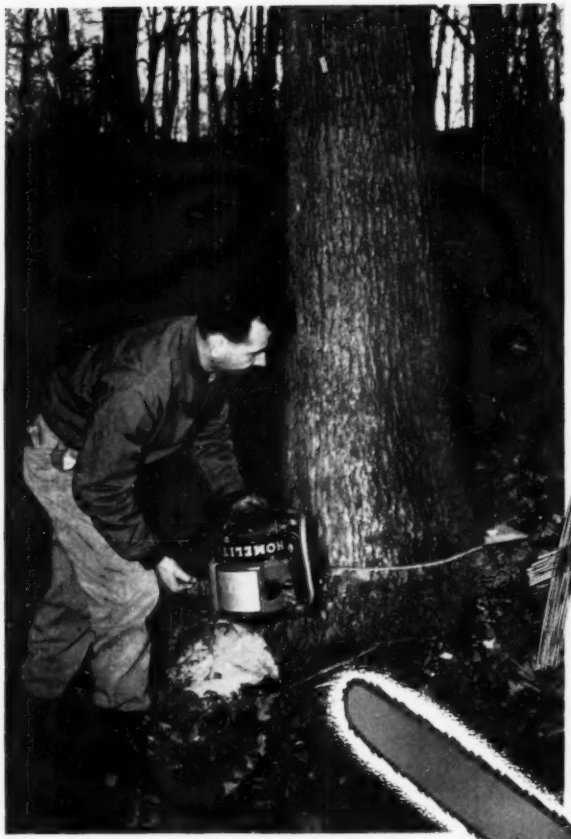

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